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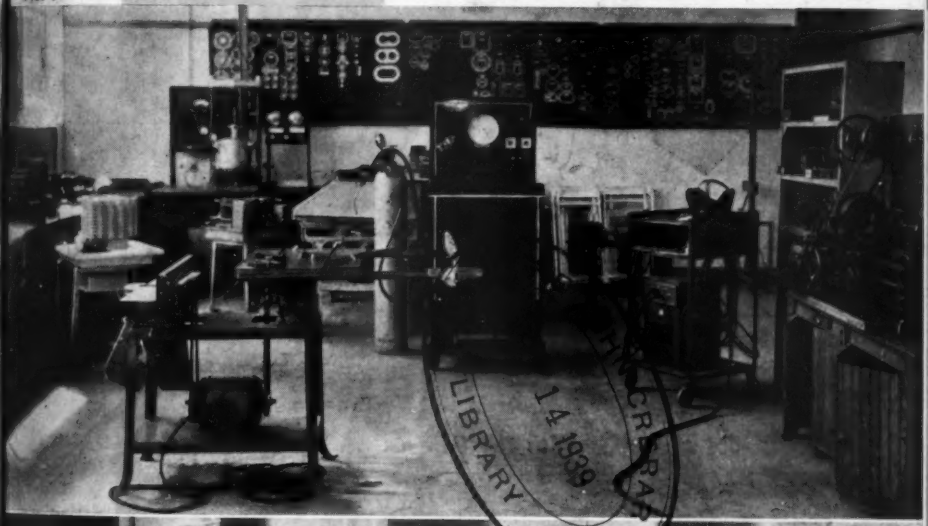

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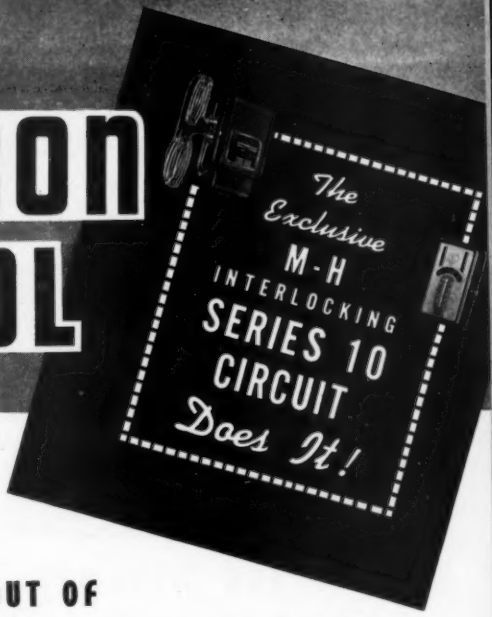
POLARTRON CONTROL



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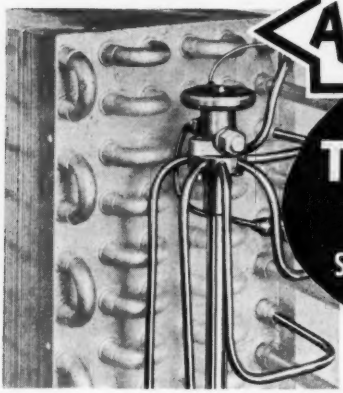

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The Refrigeration Service Engineer

Vol. 7 No. 9

September 1939

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

Official Organ
REFRIGERATION SERVICE ENGINEERS SOCIETY

Cover

Two views of one of Chicago's most modern service shops are shown on this month's front cover. They were taken on the premises of the Complete Refrigeration Sales and Service Co., owned by Mr. O. S. Heide. An article on page 53 contains further details of this organization.

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TABLE OF CONTENTS

A Portable Calorimeter, *by D. D. Wile*..... 11
A New Control for the Commercial Field..... 17
The Repair of Duco Finishes..... 20
Simplified Air Conditioning (Sixth Article), *by George G. Borden* 23
The Capacity Booster Valve, *by George H. Clark*.. 26
Licensing and Bonding Regulations in Wisconsin.. 29
Brittle Copper Tubing..... 31
Service Kinks 34
Service Methods of an Old-Timer..... 34
Motor Bearing Drift..... 36
Grunow Puller Attachment..... 36
Spring Winding Jig..... 36
Question Box 37
Ilg Refrigerator 37
Refrigerating a Display Window..... 37
Ice Cream Cabinet Leaks..... 38
Gasoline Powered Refrigerator..... 40
Cold Weather Troubles..... 41
Relief for Hay Fever Cases..... 42
R.S.E.S. News 44
Let's Go to Chicago..... 44
Wisconsin State Assn. to Hold Annual Picnic.. 47
Illinois State Assn. to Hold Convention Nov. 4-5 48
Second Annual Picnic of Springfield Chapter.. 48
Rockford Ladies' Auxiliary..... 49
Chapter Notes 50
News of the Industry..... 53

The Refrigeration Service Engineer

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A Portable Calorimeter for Small Compressors*

By D. D. WILE **

REFRIGERATION condensing units are often times rated merely upon the h.p. of the motor which is used to drive the compressor, without definite reference to the amount of refrigeration produced. Experience has shown that the output may be greatly different for various compressors, even though the driving motor is of exactly the same size. The refrigerating effect of the condensing unit can be determined by several methods. The two methods most frequently used consist in:

1. Measuring the flow of liquid refrigerant by means of flow meters or measuring drums, or
2. Balancing the refrigeration effect by the heat input to the evaporator by means of electrical heaters, steam heaters, etc. The apparatus used in this method is called a calorimeter.

The calorimeter method is the most widely used method for accurately determining the output of a refrigeration unit. For small and medium sized compressors electrical calorimeters are almost invariably used due to the ease with which the electrical energy can be measured. In operating the calorimeter some method must be used so that the electrical input to the calorimeter exactly balances the refrigeration effect, then it is a very simple matter to convert the electrical energy to B.t.u.'s of refrigeration. Each watt-hour of electrical energy is equivalent to 3.412 B.t.u. Therefore, to obtain the B.t.u. refrigerating effect of the condensing unit we multiply the watt-hour input to the calorimeter by 3.412. If the results are desired in tons of refrigeration effect, then the B.t.u. per hour refrigerating effect is merely divided by 12,000.

This particular calorimeter differs from other electrical calorimeters generally in use by the fact that the electric heater is controlled automatically by an ordinary pressure control so that it turns on and off intermittently. This eliminates the necessity for careful and delicate adjustment of rheostats, as generally employed.

Some of the more advanced service shops have apparatus for measuring the perform-

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** Chief Engineer, Refrigeration Division, Savage Arms Corporation, Utica, N. Y.

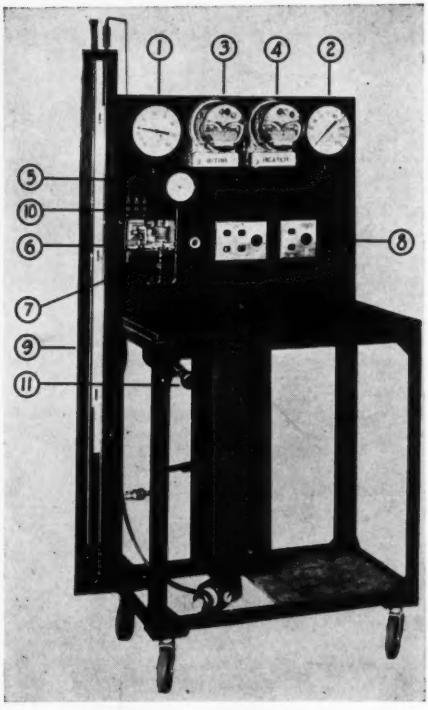


FIG. 1. (ABOVE) PORTABLE CALORIMETER

1—Suction gage.
2—Discharge gage
3—Watthour meter for motor
4—Watthour meter for heater
5—Pressure gage for secondary refrigerant
7—Sight glass for liquid feed line
8—Control switches and plug receptacles
9—Mercury column for suction pressure
10—Thermocouple jack
11—Adjusting knob for expansion valve

ance and efficiency of electric motors. It would seem entirely logical for a good service shop to have a calorimeter by which to measure the performance and efficiency of the entire condensing unit. The use of a good calorimeter eliminates all guesswork as to the capacity and efficiency of a refrigerating unit. They are indispensable in laboratory and development work.

Briefly, the calorimeter furnishes the following information:

1. Output from the condensing unit in terms of B.t.u. per hour or tons.
2. Input to the driving motor in terms of watts, volts, amps.
3. Efficiency of the condensing unit in terms of B.t.u. output per watt-hour input.
4. Various other readings such as head pressure, suction pressure, etc.

Advantages of This Design

Many of the calorimeters used for compressor testing have the disadvantage of requiring much time for each test run and depending for accuracy upon tedious manipulation of delicate adjustments. The calorimeter described in this paper overcomes these disadvantages and has a number of desirable features, some of which are:

1. Compact and easily portable.
2. High degree of accuracy.
3. Moderate cost.

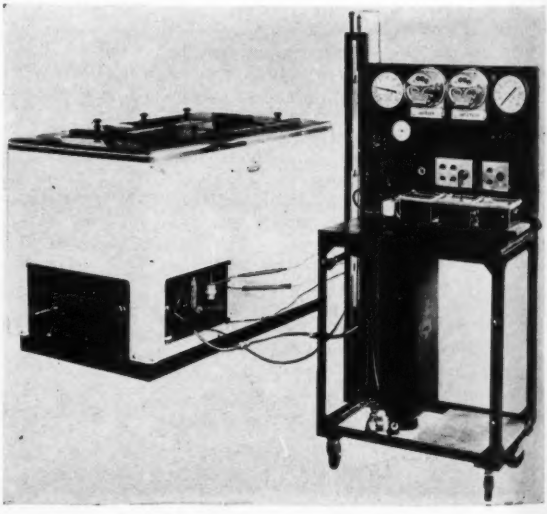


Fig. 2.—Calorimeter connected to compressor to measure performance under operating conditions.

4. Short time required for test runs.
5. Does not require accurate regulation of line voltage.
6. Reasonably fool proof.

The design is of the secondary refrigerant type using intermittent heater operation, the heater being controlled by a pressure switch working on the pressure of the secondary refrigerant. Both heater input and motor input are measured by watthour meters having fast reading dials. Suction pressure is regulated by a constant pressure expansion valve and superheat of the suction gas can be controlled by varying the pressure of the secondary refrigerant.

When conducting a test, the only adjustments required are: (1) adjust expansion valve for desired suction pressure, (2) adjust pressure control for desired superheat. Neither of these adjustments is in any way delicate and once set they remain constant. Since the operation is completely automatic, no attention is required except for noting meter readings at the start and finish of the test run. Three minutes is sufficient time to assure an accuracy of better than 2 per cent.

Fig. 1 shows a general view of the complete calorimeter and in Fig. 2 it is shown connected to the compressor of an ice cream cabinet in order to measure performance under actual operating conditions.

Construction

As shown in Fig. 1, the calorimeter cell or "boiler" with its insulated enclosure is mounted within a metal frame. This frame also supports an instrument panel and provides a flat surface for use as a desk. The frame rests on casters for easy portability. The various instruments on the panel are:

1. Suction gage.
2. Discharge gage.
3. Watthour meter for motor.
4. Watthour meter for heater.
5. Pressure gage for secondary refrigerant.
6. Pressure control for secondary refrigerant.
7. Sight glass for liquid feed line.
8. Control switches and plug receptacles.
9. Mercury column for suction pressure.
10. Thermocouple jack.
11. Adjusting knob for expansion valve.

Detail construction of the boiler is shown in Fig. 3. A 4-in. receiver having thin walls was used for the outer shell. The coil consists of 17 ft. of ½-in. steel tubing. The heater well was kept small in order to hold a minimum quantity of refrigerant. Sight glasses provide means for inspecting the height of liquid.

Heater Construction

The ordinary type of immersion heater has entirely too much lag and will cause long heater cycles. Much of the success of the apparatus depends on the design of this heater.

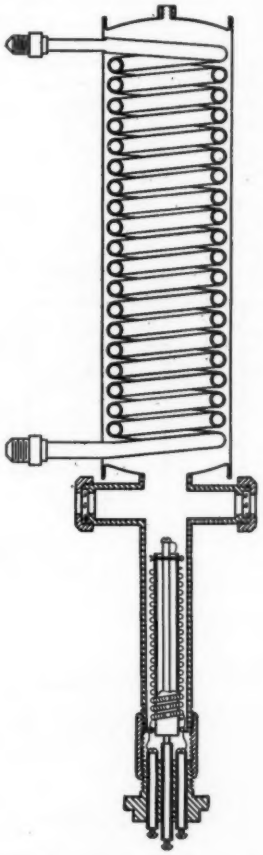


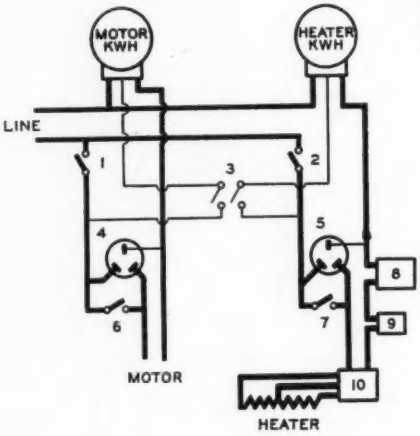
Fig. 3.—Cross section of Calorimeter Boiler

The heater shown in Fig. 3 has its wire element in direct contact with the liquid Freon in the boiler. It was constructed by winding the wire in a long coil and then wrapping the coil on a bakelite tube. The heater has two sections which are connected

through a three-heat switch so as to supply 275, 550 or 1100 watts. Leads to the heater are carried through bakelite bushings machined to a tight press fit.

Watthour Meters

The ordinary watthour meter reads directly to one kilo-watthour and at best, readings can be estimated no closer than 100 watthours. In a three-minute run on a ⅓ h.p. compressor, operating at low suction pressure, the heater consumes only about 20 watthours. Obviously a fast reading meter is required.



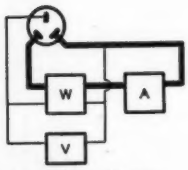


Fig. 4.—Wiring diagram

Special watthour meters were obtained with a dial ratio 1000 times as fast as normal. These meters read directly in watthours and can be estimated to a fraction of a watthour. This type of meter has been developed to a high degree of accuracy and is relatively inexpensive. They can be easily checked at any time by means of a portable standard.

For some applications there would be a considerable advantage in using portable standards in place of the watthour meters. These standards are not only very accurate, but they can be read directly to a fraction of a watt. This is particularly important when testing small size compressors.

The potential coils of the watthour meters are connected through a double pole switch so that when the switch is closed both meters start simultaneously. Thus the input to the heater and motor is measured over identical periods and the meters are read before and after the run while they are not registering.

Wiring Diagram and Pressure Control

The wiring diagram shown in Fig. 4 provides complete control of the apparatus, including plug-in receptacles for indicating wattmeter, voltmeter and ammeter.

1 and 2 are line switches for motor and heater.

3 is the switch which connects the potential coils of both watthour meters.

4 and 5 are 3-prong receptacles for connecting indicating wattmeter, ammeter, and voltmeter.

6 and 7 are short circuiting switches for the ammeter connections.

8 is the pressure switch which operates the heater.

9 is a thermally operated safety switch, attached to the heater well, which opens if the temperature of the boiler should become abnormally hot.

10 is the three heat switch for the heater connections.

The pressure switch which controls the heater must have a small differential. The switch shown is of the conventional mercury tube type and can be adjusted to operate on about a 1-lb. differential.

Safety Features

In the event of failure of the pressure control, extreme pressure would be prevented by the thermally operated switch, which opens the heater circuit when the temperature of the heater well becomes higher than normal. This thermal switch also protects the apparatus in the event that the secondary refrigerant charge should escape. There is also a fusible plug to relieve excessive pressure, should it ever occur.

The suction gage and the mercury column are protected against high pressure by constant pressure expansion valves in the connecting lines. These valves are arranged so that the inlet side of the valve connects to the instrument. When pressure rises to a

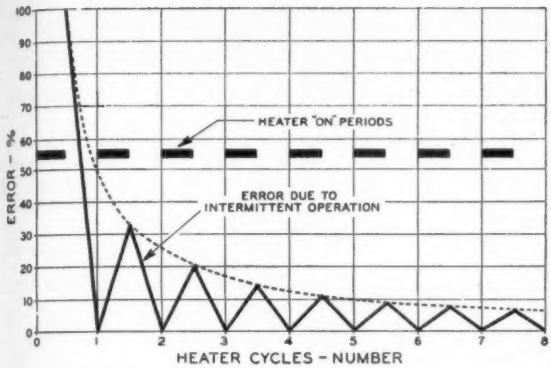


Fig. 5.—Error due to intermittent operation of heater

predetermined point, the valve shuts and prevents further increase in pressure on the gage or mercury column.

Operation

The original running in of the compressor can, if desired, be done on the calorimeter, the required conditions being maintained automatically, without attention.

After connecting up a compressor for test it is allowed to operate at least long enough to stabilize the temperature of the motor and compressor body. The desired suction pressure is obtained by turning the expansion valve adjustment. Superheat of the suction gas is controlled by adjusting the pressure in the boiler by means of the pressure control. Readings are taken of the watthour meters and then the test run is started by closing the recording switch and starting a stop watch at the same time. After sufficient time, the test run is terminated by opening the switch and stopping the watch. The new readings of the watthour meters are then recorded. The increase in meter readings multiplied by 60 and divided by the length of run represents the watt input to heater and motor.

Error Due to Intermittent Operation

The on and off operation of the heater causes its watthour meter to run intermittently. Each time the heater operates the meter records faster than the average input rate, the following off period balances this condition so that the reading then equals the average rate. Since a test run will not necessarily constitute an exact number of complete heater cycles there is always the possibility of a residual error due to the intermittent operation.

The test run must be long enough to reduce the percentage of the residual error to a negligible amount. A simple rule has been developed to determine the length of run required for any calorimeter of this type.

Fig. 5 shows the manner in which the per cent error fluctuates during each heater cycle. The heavy dashed line represents heater operating periods. This particular curve is for a heater operating 50 per cent of the time. During each cycle the error varies between zero and a maximum valve which gradually decreases with each succeeding cycle.

Fig. 6 shows how the maximum per cent

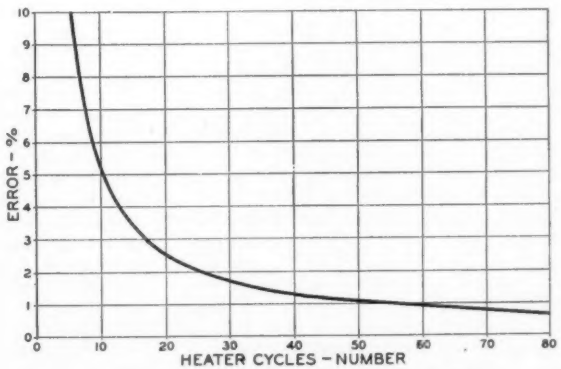


Fig. 6.—Error due to intermittent operation after large number of cycles

error of Fig. 5 decreases after continued operation.

If the run happens to start with a heater on cycle, the maximum error will always be positive, while if it starts with an off cycle it will always be negative. These two conditions produce an error which, of different sign, is of the same magnitude. If the run starts part way through an on or off cycle, the error may be plus or minus but will always be less in magnitude. Furthermore, a high rate of heater input, resulting in a small per cent operating time, causes a larger error for any given number of cycles. However, it can be shown mathematically and tests also prove that, where the heater is designed for negligible heat lag, a high rate of input causes the cycles to become shorter and the total time required for the run remains the same.

The maximum error in percent for any number of cycles and any heater ratio is expressed as follows:

$$E = \frac{100}{\frac{N}{1-R} - 1}$$

where E = Percent error.
N = Number of cycles.
R = Ratio of heater operating time.

This equation can be rearranged to show the number of cycles required to reduce the possible error to any given amount.

$$N = (1-R)\frac{100}{E} + 1$$

Since the percent error is usually limited to a small quantity, the above equation can be simplified to:

$$N = \frac{100}{E}(1-R)$$

It can also be shown that:

Length of off cycle = Total length of cycle $\times$ $(1-R)$ and combining these last two equations we obtain the expression:

$$N \times \text{Length of total cycle} = \frac{100 \times \text{Length of off cycle}}{E}$$

$$\text{Total run} = \frac{100}{E} \times \text{Length of off cycle}$$

$$\%\ \text{error} = \frac{100 \times \text{Length of off cycle}}{\text{total time of run}}$$

which indicates that for any calorimeter of this type the error due to intermittent operation depends only upon: (1) length of off cycle, and (2) length of run.

This relationship can also be established by another approach:

The maximum error occurs when the test run starts at the beginning of a heater cycle and finishes at the end of a heater cycle. Then the residual error equals the excess B.t.u. stored in the calorimeter, but:

B.t.u. stored in calorimeter = Length of off cycle $\times$ refrigeration rate and

$$\frac{E}{100} = \frac{\text{B.t.u. stored in calorimeter}}{\text{Refrigeration rate} \times \text{total time}}$$

substituting:

$$\frac{E}{100} = \frac{\text{Length of off cycle}}{\text{Total time}}$$

Therefore, to determine the length of run required for any desired accuracy it is only necessary to measure the length of the off cycle and divide it by the required accuracy.

Since the length of the off cycle is directly proportional to the heat capacity of the calorimeter and inversely proportional to the refrigeration rate, it follows that the heat capacity should be kept small in proportion to the size of compressor to be tested.

Performance

Although the present unit was designed for a capacity of only 3700 B.t.u. of refrigeration per hr., it appears evident from our observations that a considerably higher capacity could be obtained by merely increasing the size of the electric heater and corresponding watthour meter rating.

Due to the large difference in temperature between secondary refrigerant and primary refrigerant, the rate of heat transfer though the evaporator coil is very rapid. When operating at 1300 B.t.u. per hr. the gas leaves the calorimeter only two degrees colder than the boiler temperature. There is no disadvantage in maintaining a higher boiler temperature, in fact it would reduce heat leakage under most conditions of operation. Consequently, from the standpoint of heat transfer, this calorimeter is capable of many times its present capacity.

Pressure drop through the calorimeter coil is also an unimportant factor, since we are interested only in the outlet pressure. We believe that the capacity could be increased several times without developing excessive pressure drop.

With a refrigeration rate of 1300 B.t.u. per hr., this calorimeter has an off cycle of somewhat less than two seconds and consequently a test should be continued for 3 min. in order to reduce the intermittent error to 1 per cent. It so happens that this much time would also be required to build up a sufficient reading on the watthour meters to insure equal accuracy. Numerous tests have proved that with this rate of refrigeration a three minute run will produce results within 1 per cent plus or minus.

A New Control for the Commercial Field

IN the past it has been the custom to control refrigerating systems with a fixed differential control operated either from coil conditions or from fixture air temperature.

An ordinary pressure or temperature control with fixed differential operating on coil conditions can not give correct fixture air temperatures under all of the varying load conditions. The temperature of the fixture air will raise with heavy load conditions and will lower with light load conditions.

An ordinary temperature control with fixed differential operating on fixture air temperature can not provide proper defrosting of the coil under varying load conditions. The coil will not defrost under heavy load.

The new type 91G2 Two-Temperature Control designed by Ranco Inc., is a combination of coil and air temperature control which maintains proper fixture air temperature and assures defrosting of the coil under all load conditions. It consists of a simple temperature operated toggle switch having a constant cut-in characteristic and a variable cut-out.

Starting or cut-in of the control is based upon the defrosting temperature of the coil. Stopping or cut-out is based upon the fixture air temperature. Thus it cuts in only when the coil is defrosted and cuts out only when the refrigeration requirements in the fixture are satisfied.

Starting or cut-in point remains constant under all load conditions. The operating differential varies with each change of conditions to provide the exact amount of required refrigeration.

Normally the control cuts in at a predetermined coil temperature and cuts out at a predetermined fixture air temperature. Under abnormal conditions where the fixture air temperature is already equal to or lower than the predetermined desired value the control will cycle on changes in coil temperature only.

This frequent cycling provides air circulation during periods of light load, improving humidity conditions; provides greater efficiency, higher relative humidity and more uniform fixture temperature with a higher average coil temperature; eliminates the usual pressure control seasonal adjustments on all portions of any refrigeration system controlled by this new control.

The adjustment knob (L) Fig. 1 on the outside of the control provides accessible means for the customer to make limited adjustment of the fixture temperature without affecting the defrosting of the coil.

Figure 2 is the schematic arrangement of the Ranco Two-Temperature Control. The portion indicated by the letters C, D, F, G, H, and S has a fixed cut-in characteristic which is governed by a predetermined temperature of the coil. The portion indicated by the letters A, B, E, J and L operates on fixture air temperature and governs the cut-out.

The cut-in point of the control is governed by the temperature at either point K_1 or point K_2. Point K_1 is usually preferred, if accessible.

Field tests have proven that the most nearly ideal method of attaching the coil-capillary K to the coil, is by threading at least 24 inches of the capillary tube between fins and winding it tightly around all of the coils at the point where ice disappears last when defrosting. The end of the capil-

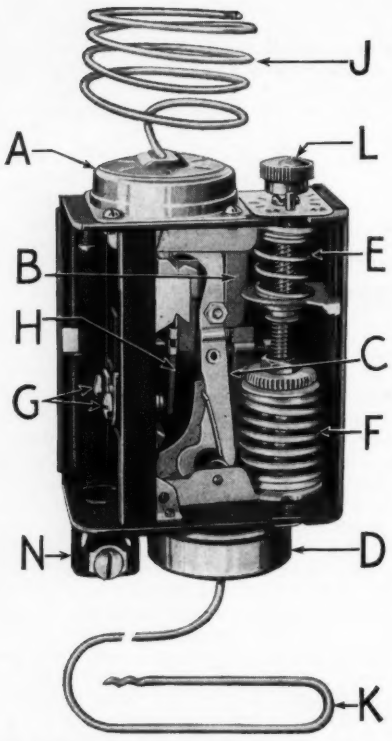


Fig. 1—The Ranco 91G2 Control with cover removed showing the relative position of each part. The letters correspond with those in Fig. 2.

lary tube may be hooked on a fin to prevent loosening of the capillary as shown in Figure 3.

Tube K has a "hairpin loop" instead of the usual large bulb, to give a more intimate contact with the coil and be less affected by air temperature and be easier to clamp to a reverse bend of the coil. Two clamps are furnished with each control for clamping this six inch portion of the tube. The tube has a total length of 96 inches, which is sufficient for most applications.

Operation of the Control

Fig. 2 illustrates the positions of all parts of the Two-temperature control just after defrosting temperature has been reached at point K_1 (or K_2, whichever was used). The control has cut-in (closed electric circuit). The fixture temperature is approximately correct, so that lever I is free of lever B.

The compressor is now running. When the temperature of the coil at point K_1 (or K_2) lowers, the gas pressure in bellows D correspondingly lowers, allowing spring F to force lever C down tending to make the simple temperature control cut-out.

As the coil temperature lowers lever I moves over toward lever B. At the same time the fixture temperature lowers, reducing the pressure in bellows A. Lever B may then back away from its stop and lever I, but due to the comparatively rapid lowering of the coil temperature, lever I overtakes and is retarded by lever B. Therefore lever B must move back far enough to permit lever I to open the switch contacts or the control cannot cut-out. Remember that the movement of lever B is determined by the fixture temperature and until the fixture is lowered to its proper temperature, lever B remains in the way of lever I, but permits the control to cut-out as soon as the predetermined desired fixture temperature is reached.

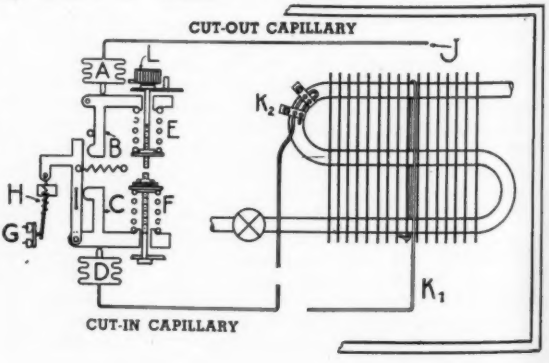


Fig. 2—Schematic diagram of the Ranco control. The upper portion designated by the letters A, B, E, J and H is actuated by the fixture temperature and governs the cutout point in the control. The lower portion governs the cut in temperature and is actuated by the coil temperature. K_2 and K_1 are two methods of attaching the control bulb to the coil.

The fixture cut-out temperature may easily be changed by turning the adjustment knob L on the outside and top of the control. A stop limits the adjustment of the knob to one revolution, 8 degrees F. Further adjustment is possible by removing the knob and replacing it with the pointer on the opposite side of the stop. However, the scale for knob L is calibrated 34 degrees, 38 degrees, and 42 degrees, which permits setting of the cut-out point anywhere between 34 degrees and 42 degrees F. (usually correct for display cases and walk-in coolers) by merely turning the knob.

Installation

The control must be mounted inside the fixture when the room temperature might be lower than the fixture temperature. Remember that the temperature-responsive portions of the two power elements must always be the coldest portions of those power elements and control. Assuming that the cut-out setting of the control is 36 degrees F., the control must be mounted where its surrounding temperature will always be higher than 36 degrees. If the surrounding temperature is lower than 36 degrees, the control will cut-out, and so remain.

The control should be mounted so that 24 inches or more of the tube J may be placed in the air stream which is to govern the cut-out, and there be supported with screw eyes. This 24 inch portion of tube J must always be colder than any other point on this power element. It is recommended that this tube be installed in a straight line, as shown in Fig. 4. Tube J is 72¼ inches long, for convenience in locating the 24 inch controlling portion.

Connecting Other Controls

Either or both a low pressure control and high pressure cut-out are frequently a part of the compressor. These may be connected in series electrically with the type 91G2 so that the high pressure cut-out may serve its usual function, and the low pressure control may be so adjusted as to prevent pumping an undesirable vacuum. Otherwise, the low pressure control may be eliminated from any installation except a multiple unit system having one or more units operated at a much lower temperature than the unit containing the defrosting coil. It may then be used to control the compressor.

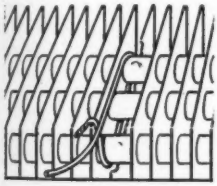


Fig. 3—Showing method of attaching the capillary tube to the coil.

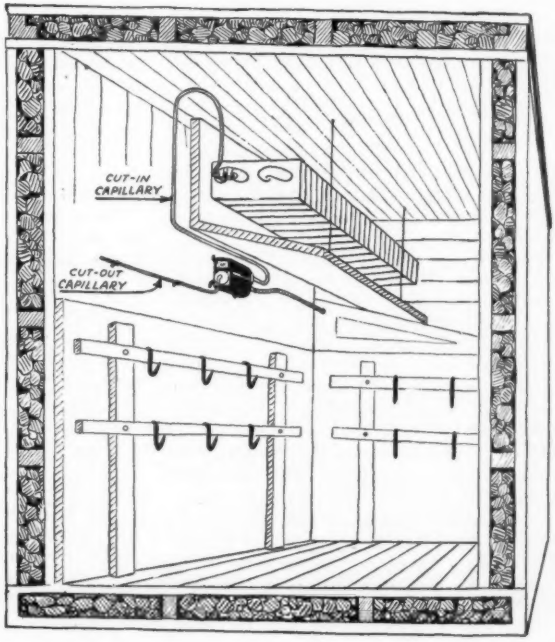


Fig. 4—Illustrating the method of installing the control in a walk-in cooler. The control you will note is installed in the warmest area of the refrigerated space.

Applications on Multiple Unit Systems

On a multiple unit system having all defrosting coils fairly well balanced with respect to their heat loads, the Ranco Two-temperature control used in the largest fixture to control the compressor operation, generally provides proper operation for all the units without additional equipment.

On a multiple unit system having one or more units operated at a much lower temperature than the unit containing the defrosting coil, the compressor may be operated by the control that is responsive to the temperature of the low-temperature unit, and the Ranco Two-temperature control may be used to govern the operation of the defrosting coil in connection with a solenoid valve.

On a multiple unit system having one or more units operated at temperatures higher than the temperatures required on the defrosting coil, the compressor may be operated by the Ranco Two-temperature control responsive to the defrosting coiled unit. The unit or units operating at higher temperatures may be controlled by conventional temperature controls in connection with solenoid valves.

When air temperatures are required to be so low that coils cannot defrost each cycle, the hot gas method of defrosting is no doubt the most practical. The Ranco Two-temperature control in this connection will provide the most accurate control of the system due to the fact that the cut-in point will be held at the required coil temperature, and the cut-out point will occur only when the desired air temperature is reached.

The Repair of Duco Finishes

THE subject of servicing Dulux Refrigerator Finishes may be conveniently divided into two sections: first, the patching or refinishing of panels and, secondly, the complete refinishing of the cabinet. These two divisions will be taken up in order.

Patching

In order to clarify the use of patching materials for refrigerator Dulux, it is first desirable to review the color changes that will be undergone by a Dulux finish from the time that it is freshly baked by the refrigerator manufacturer until it has seen several years of field service. The first baking Dulux used by refrigerator manufacturers, and still used by many, is known as 104 Line Dulux. This product has a slight cream cast as it comes from the manufacturer's oven which will disappear upon exposure of the finish to the light, leaving the finish actually whiter. This process is known as bleaching and will require only two hours for completion in strong sunlight, whereas it may take days or weeks, or, in a few cases, months, for complete bleaching in indirect or diffused light. Obviously enough, as most finished cabinets are never exposed to strong sunlight, refrigerators when received by a dealer for sale may not be completely bleached, particularly as no bleaching can occur in the crate. After the finish has reached the end-point of bleaching, it begins to assume a very gradual change toward a cream tone. This change in color is extremely slow and under normal service conditions is noticeable only by comparison with the original color. This gradual change continues throughout the life of the refrigerator.

Patching 104 Line

Duco is recommended for touching-up metal refrigerators and for finishing parts except the food compartment.

For complete refinishing, Refrigerator Dulux is recommended.

For the patching of 104 Line Dulux, we recommend the use of 236 Line Duco. Two products are offered in this connection:

236-1136 Duco Refrigerator White (Matched in color to bleached 104 Line Dulux)

236-1050 Duco Refrigerator Cream White (Matched in color to aged baking Dulux)

It is obvious from the above explanation of the color changes which take place that all new 104 Line finished cabinets should be patched with 236-1136, as the finish, if not already bleached, will bleach to this color

before long. Although the 236-1136 patch may seem slightly white by comparison with a partially bleached finish, it will be less objectionable than a patch which matches at the time and later appears yellow due to further bleaching of the cabinet.

For cabinets which have been in service, a blend of 236-1136 and 236-1050 should be used to match the color of the finish. 236-1050 is matched to the color to which a Dulux baking finish will drift after about five to seven years' service.

As mentioned above, these 236 Line Duco materials are recommended for patching and also for the refinishing of panels.

704 Line Baking Dulux

The other type of baking Dulux used by refrigerator manufacturers is known as 704 Line Duluxe. This finish, although similar to the 104 Line in many respects, has a considerably smaller degree of bleach, and is slightly whiter in color. With age, this finish likewise gradually drifts toward a cream tone.

Patching 704 Line

For the patching of 704 Line Dulux also, we recommend the use of 236 Line Duco. Two products are available:

236-1011 Duco Refrigerator White (Matched in color to bleached 704 Line Dulux)

236-1050 Duco Refrigerator Cream White (Matched in color to aged baking Dulux)

As in the case of 104 Line, new cabinets should be patched with the Duco White matching the bleached finish; in the case of 704 Line, 236-1011 Duco should be used for patching or panel refinishing on all new cabinets. For boxes which have been in service, a blend of 236-1011 and 236-1050 should be used to match the color of the finish.

It will be noted that the same Duco material, 236-1050, may be blended to match the cream tone of both 104 and 704 Dulux finishes.

This means that three Duco items: 236-1136, 236-1011 and 236-1050 should suffice for all patching or panel refinishing of Dulux finished refrigerators.

Directions for Use

Stir thoroughly in order to incorporate the pigment with the vehicle.

Reduce Duco with 3614-G Duco Thinner in the proportion of one gallon of the former and 1½ gallons of the latter.

The surface must be dry and free from grease, oil, polish, etc.

Sand spots thoroughly with No. 360 abrasive and oil-free naphtha to remove rust, etc. Edges of the finish should be sanded down so that they cannot be felt. If metal is exposed, spray spots with 233-1088 White Primer-Surfacer reduced with one and one-half volumes of thinner to build them up to surrounding surface. Any imperfections which the Primer-Surfacer has not filled should be knifed out with 228-5163 White Pyroxylin Glazing Putty. If no putty is used the Primer-Surfacer should be allowed to dry about 30 minutes and sanded with No. 400 abrasive and water. If putty is used, it will be necessary to allow about three hours for drying before sanding with abrasive and water.

Spray two or more coats of Duco at about 30 lbs. pressure.

Allow patch to dry about four hours and rub out spray dust with No. 7 Duco Polish.

If the parts have not been finished, sand with "Deoxidine" (American Chemical Paint Co., Ambler, Pa.), "Metalprep" (Neilson Chemical Co., Detroit, Mich.) or other approved rust remover. Immediately spray one light, semi-transparent coat of 475-7316-R White Metal Primer, and allow about 24 hours to dry and scuff primer lightly with No. 400 abrasive.

Spray two or more coats of Duco.

Allow to dry about four hours and rub up with No. 7 Duco Polish.

Refinishing Cabinets

The second division of this subject, the complete refinishing of cabinets, can be disposed of very easily. Duco or Air Dry Dulux may be used for the complete refinishing of refrigerator cabinets. Any of the Duco enamels mentioned above may be used, although 236-1011 or 236-1136 will be preferred, of course, because of their whiter color. If Dulux is used, we recommend 81-5765 Air Dry Refrigerator White Dulux, which is a match for 236-1136 Duco. Another Dulux is available; viz., 81-5932 Cream White, which is matched in color to aged Baking Dulux. It is intended for tinting 81-5765 to secure intermediate shades.

We do not recommend the use of Air Dry Dulux for patching, although some operators prefer it for patching of 104 Line Baking Dulux. Air Dry Dulux must never be used

TABLE 1—REFRIGERATORS FINISHED WITH BAKING DULUX

BRAND	MANUFACTURED BY	TYPE FINISH (Line)
Apex	Apex Electric Co.	104
Bohn	Bohn Refrigerator Co.	704
Cold Spot	Sears, Roebuck & Co.	704 and 104
Conservador	Philco Mfg. Co.	104
Coolerator	Coolerator Corp.	704
Copeland	Copeland Refrigerator	704 and 104
Econom-icer	Ranney Refrigerator	104
Frigidaire	Frigidaire Division—General Motors	704
Gale	Gale Products, Division of Outboard Marine & Mfg. Co.	704
General Electric	General Electric Co.	104
Gibson	Gibson Refrigerator Co.	704
Heinz & Munschauer	Heinz & Munschauer	104
Hot Point	General Electric Co.	104
Icedaire	McKee Refrigerator Co.	704
Ice-O-Matic	Williams Ice-O-Matic	704
Jewett	Jewett Refrigerator Co.	104
Johnson	Johnson Motors	704
Klondike	Maine Mfg. Co.	704
Marshall Wells	Marshall Wells	104
Mayflower	Mayflower Electric Co.	704
Norge	Norge Division—Borg Warner Corp.	104
O'Keefe & Merritt	O'Keefe & Merritt Co.	704
Otis Horne	Otis Horne	104
Shelvador	Crosley Corp.	704
Sparton	Spark-Withington	104
Speed Queen	Barlow & Seeling Mfg. Co.	704
Stewart-Warner	Stewart-Warner Corp.	104
Supre-Macy	R. H. Macy Co.	704
Trukold	Montgomery Ward Co.	704 and 104
Universal	Landers, Frary & Clark	704 and 104
Ward	Ward Refrigerator Co.	704
Westinghouse	Westinghouse Electric & Mfg. Co.	704
White Seal	Cavalier Corp.	704

on new 704 Line, because it is not white enough to match the 704 color.

Table 1 lists the manufacturers who use Refrigerator Baking Dulux, and the type (104 Line or 704 Line) used by each.

Refrigerator Dulux is recommended for the complete refinishing of metal refrigerators, except the food compartment.

Directions for Use

Stir thoroughly in order to incorporate the pigment uniformly with the vehicle.

Reduce Refrigerator Dulux with about 10 percent of T-3812 Automotive Dulux Thinner.

The surface must be dry and free from grease, oil, polish, etc.

Refrigerator Dulux may be applied over the old finish, or the old finish may be removed.

Applying Over Old Finish

Sand thoroughly with No. 360 abrasive and oil-free naphtha. Rust spots, where finish has been broken, should be rubbed bright, and edges of finish should be sanded down so that they cannot be felt. Spray damaged spots with Refrigerator Dulux to build them up to surrounding surface. Allow 24 hours to dry.

No primer or surfacer is necessary.

Spray two or more light coats at 50 to 80 lbs. pressure, allowing 24 hours between coats. A heavy film will result in slow drying and sub-standard hardness.

How to Remove Old Finish

Strip off old finish with VA-916 Du Pont Super Removo and wash carefully with Thinner to remove wax. Sand metal with "Deoxidine" or "Metalprep" or other approved rust remover.

No primer or surfacer is necessary.

Spray three or more coats of Refrigerator Dulux at 50 to 80 lbs. pressure, allowing 24 hours between coats.

Robert O. Brown
Minnesota

Enclosed please find money order for $2.00 and your order for my renewal subscription to THE REFRIGERATION SERVICE ENGINEER.

This magazine has three main features: First, good reading to keep abreast with the new developments in the field; second, makes a wonderful reference library; third, has an invaluable Question Box feature.

Sixth Article

Simplified Air Conditioning

By GEO. G. BORDEN

IN previous articles it was stated that the total heat in a pound of air can be found if the wet bulb temperature of the air alone is known, and as the wet bulb temperature increases, the total heat in the air increases.

Total heat is made up of both sensible and latent heat. We might increase the wet bulb temperature of a pound of air from 55 degrees to 70 degrees by just adding sensible heat to the air without adding any latent heat. For instance we might have a pound of air at 57½ degrees dry bulb, 55 degrees wet bulb and pass this air over a hot radiator. In passing over the radiator the air would become warm but the radiator would neither add to nor subtract from the moisture content of the air. Because sensible heat had been added to the air, the wet bulb temperature of the air would increase. When the wet bulb temperature reached 70 degrees, the dry bulb temperature of the air would be 100 degrees.

The final dry bulb temperature can be determined by two methods. First we know that we have increased the wet bulb temperature from 55 degrees to 70 degrees by adding only sensible heat to the air. From the above table we see that air at 55 degrees w.b. holds 23 B.t.u. per pound whereas air at 70 degrees w.b. holds 33 B.t.u. per pound. In other words we have increased the heat content of the air by 10 B.t.u. of sensible heat. Then since .241 B.t.u. will raise the temperature of one pound of air one degree F., 10 B.t.u. will raise the temperature of one pound of air $42\frac{1}{2}$ degrees F. $\frac{10}{.241} =$ 42.5. If we add $42\frac{1}{2}$ degrees to $57\frac{1}{2}$ degrees we get a final air temperature of 100 degrees F. dry bulb.

A lot simpler method of solution is to use the psychrometric chart. We know from our past definitions, that dew point temperature is the temperature at which the air becomes 100 percent saturated. As we keep lowering the temperature of air, its ability to hold moisture decreases. Eventually if we lower the temperature far enough, the air will not be able to hold all the moisture it previously held and moisture will start to condense out of it. The temperature at which condensation starts is called the dew point temperature. The dew point temperature is a function of the latent heat in the air. If air is heated or cooled without adding or subtracting moisture from it, the dew point of the air remains constant.

In this particular problem, the air was heated from $57\frac{1}{2}$ degrees d.b. 55 degrees w.b. to a new wet bulb temperature of 70 degrees without adding or subtracting any moisture. Hence the dew point temperature of the air must have remained constant. To solve this problem by means of the psychrometric chart we merely locate the intersection of the $57\frac{1}{2}$ degrees d.b. 55 degrees w.b. lines. The horizontal line through this intersection is the dew point line. We follow this horizontal line to the right until it intersects the slanting 70 degrees wet bulb line and read off the dry bulb temperature as 100 degrees F.

Let's work out several of these problems to be sure we get the procedure. Let's take air at 70 degrees d.b. 65 degrees w.b. and heat it to 75 w.b. What will the final dry bulb temperature be? From the intersection of the 70 degrees d.b. 65 degrees w.b. line we go horizontally to the right till we intersect the slanting 75 degrees w.b. line. At this point we drop down vertically to read the dry bulb temperature as $103\frac{1}{2}$ degrees.

Air at 50 degrees d.b. 50 degrees w.b. is heated to 70 degrees w.b. What is the final dry bulb temperature? The answer is 103 degrees.

Now suppose that we had a pound of air at 80 degrees 50 percent r.h. and cooled this air to 65 degrees d.b. $61\frac{1}{2}$ degrees w.b. How much moisture would be removed from this air?

To solve this problem we place a dot on

PSYCHROMETRIC CHART
Barometric Pressure 29.92" Mercury
This Chart comprises data developed by Willis H. Carrier and his associates and has been used in the formulation of the basic principles and laws upon which the science of air conditioning rests.
It is published by Carrier Corporation for use by schools, colleges, training classes, engineers, architects and technical associations.
Carrier Air Conditioning
Grains of Moisture per lb. Dry Air-A
Dry Bulb Temperature Degrees Fahrenheit
Grains of Moisture per Cubic Foot of Saturated Air-E
Vapor Pressure in Inches of Mercury-D
Cubic Feet per lb.-B
Total Heat above Zero Degrees Contained in one lb. Dry Air Saturated with Moisture-C
Volume in cubic feet of one lb. dry air saturated with moisture-B
Total heat above zero degrees contained in one lb. dry air saturated with moisture-C
Volume in cubic feet of one lb. dry air-B
Grains of moisture per cubic foot of saturated air-E
Vapor pressure-D
85° Temperature
90° Conv.-A
75° Dew-Point
80° Saturation
Wet-Bulb Temperature Lines as given on Curve-A
Humidity
of
Lakme
Copyright 1933, by Carrier Corporation

our psychrometric chart to locate the 80 degrees 50 percent condition and another dot to indicate the final condition of 65 degrees d.b. 61 degrees w.b. Since these two dots fall on the same dew point temperature line, the moisture content of the air hasn't changed and hence no moisture has been removed from the air.

Let's assume another set of conditions. Suppose we have a pound of air at 80 degrees 50 percent and we drop the conditions of this air to 60 degrees d.b. 53 degrees w.b., how much moisture will be removed from the air?

From our psychrometric chart we locate the 80 degrees 50 percent condition and then follow the dew point temperature line all the way to the left where we read the grains of moisture in a pound of air as 76 grains. Next we locate the 60 degrees d.b. 53 degrees w.b. condition on the chart and move horizontally to the left to read the grains of moisture at this dew point as 50 grains per pound. Thus in changing the conditions from 80 degrees d.b. 50 percent r.h. to 60 degrees d.b. 53 degrees w.b. we removed 26 grains of moisture from each pound of air.

Air at 95 degrees d.b. 75 degrees w.b. is cooled to 65 degrees d.b. 60 degrees w.b. How much moisture is removed from the air? From the point of 95 degrees 75 degrees we move horizontally to the left to read the moisture content as 96 grains per pound. From 65 degrees 60 degrees we move horizontally to the left to read the moisture content as 70 grains per pound. Hence in cooling air from 95 degrees d.b. 75 degrees w.b. to 65 degrees d.b. 60 degrees w.b. we remove 26 grains of moisture per pound.

Air at 90 degrees d.b. 75 degrees w.b. is cooled to 60 degrees d.b. 58 degrees w.b. How many grains of moisture are removed? The answer is 36 grains per pound. As another example, air at 83 degrees d.b. 69 degrees w.b. is cooled to 64 degrees 62 degrees. Find the grains of moisture removed from each pound of air. The answer is approximately 3 grains.

Air Mixtures

As people occupy a space they continuously throw off odor into that space, so that after a period of time an objectionable odor condition arises. In order to maintain a fresh, clean atmosphere at all times, air conditioning systems must provide a means of ventilation. Ventilation, as we know, is the process of bringing fresh air into a space. In general practice, the average store or restaurant installation requires that at least 10 cubic feet of fresh air per minute per person be brought into the space for ventilation. This means generally that between 20 percent and 50 percent of the total air passed through the conditioner will be fresh air. This fresh air is generally brought by means of a duct from a window or through a louvre in an outside wall and is led into the return air duct from the room. The fresh air will be at outside air conditions which in many cities will be 95 degrees d.b. 75 degrees w.b. whereas the balance of the air returned to the unit will be at 80 degrees 50 percent (see figure 1). Thus the air entering the unit will be a mixture of 80 degrees 50 percent air with 95 degrees 75 degrees air. Let us see how

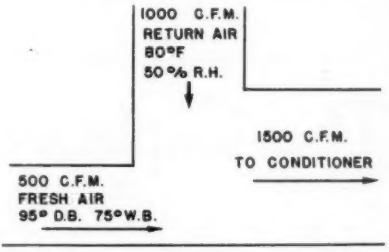


FIG. 1

we can determine what the mixture temperature will be.

Suppose that we have a conditioner that handles 1500 cubic feet of air per minute (1500 c.f.m.), and suppose that 500 c.f.m. is fresh air at 95 degrees 75 degrees and the balance is recirculated air at 80 degrees 50 percent.

From the psychrometric chart we find that 80 degrees 50 percent air has a wet bulb temperature of 67 degrees.

We can calculate what the final dry bulb condition will be by applying the following reasoning:

$$\frac{(500 \text{ c.f.m.} \times 95 \text{ deg.}) + (1000 \text{ c.f.m.} \times 80 \text{ deg.})}{1500 \text{ c.f.m.}}$$

= 85 degrees d.b., and we can apply the same reasoning to finding the wet bulb condition:

$$\frac{(500 \times 75) + (1000 \times 67)}{1500} = 69.6 \text{ deg. w.b.}$$

We can also solve this problem by using the psychrometric chart. First we locate

the points representing the two conditions of 95 degrees 75 degrees and 80 degrees 67 degrees and draw a straight line between these two points. Now the new condition of the air must be somewhere on this line.

The distance this point will be removed from the 80 degree end of the line will be determined by the ratio of the c.f.m. of the fresh air to the total air. In this case $\frac{500}{1500} = \frac{1}{3}$ or the mixture point will be $\frac{1}{3}$ of the length of the line away from 80 degrees. On measuring the distance between 80 degrees 67 degrees and 95 degrees 75 degrees we find for our particular chart the distance is $3\frac{9}{32}$ inches. One third of this distance is $1\frac{3}{32}$ inches. Measuring off this distance on the chart and locating a point on the line gives 85 degrees d.b. 69½ degrees w.b. which checks with our above results.

Let's try several other mixtures. Suppose we have 250 c.f.m. fresh air @ 90 degrees 76 degrees, 750 c.f.m. at 80 degrees 50 percent, what will the mixture be? Locate the two points and draw the line. Measure the line and on our chart it will be one inch long. Obtain the ratio between fresh air and total air

$$\frac{250}{1000} = \frac{1}{4}$$

Measure off ¼ inch from the 80 degree end of the line and place a dot. The mixture temperature is then 82½ degrees 69½ degrees.

As another example try 900 c.f.m. 75 degrees 40 percent and 300 c.f.m. 90 degrees 75 percent. The answer is 78½ degrees d.b. 64 degrees w.b.

(To be Continued)

The Capacity Booster Valve

By GEO. H. CLARK.*

THE Square D Class 9150 Capacity Booster Valve, a recent development in refrigerant control valves, is of considerable interest to the refrigeration service engineer. Its many and novel applications are intriguing, due chiefly to the fact that it varies considerably from present methods of refrigerant control.

In effect this new valve is simply a pilot operated valve so designed as to give excellent modulating action. Its modulating action is such that it serves as an excellent thermostatic expansion valve of high capacity when a small thermostatic expansion of the present type is used in the pilot circuit.

One of the advantages of this type of high capacity valve is that many different types of action can be obtained depending upon the pilot valve or combinations of pilot valves used in the pilot circuit. One of the applications which offers a considerable economy in cost and in operating advantages is one which makes use of a thermostatic expansion valve and solenoid valve in the pilot circuit. In this combination the action of a 60 ton thermostatic expansion valve and solenoid stop valve are combined at a cost of not more than two-thirds the cost of either type of 60 ton valve alone.

The operation of this valve combination can be readily understood by reference to figure 1. The liquid line from the receiver is connected to the inlet of the capacity booster valve "A." The outlet of the valve "B" is connected to the inlet of the evaporator. The pilot circuit outlet "C" is connected to the inlet of a thermostatic expansion valve "D" whose outlet is screwed into the inlet of a solenoid valve "E." The solenoid valve outlet in this case is a special bottom plug while the normal solenoid valve outlet is plugged. The solenoid valve outlet is screwed into the pilot return connection "F."

The solenoid valve would be tied in electrically with a cooling thermostat and manual push button. With either the thermostat or push button switch open the solenoid valve would be closed. In this case with the pilot circuit closed the pressure in the cylinder of the booster valve will equalize with

* Square D Company, Detroit, Mich.

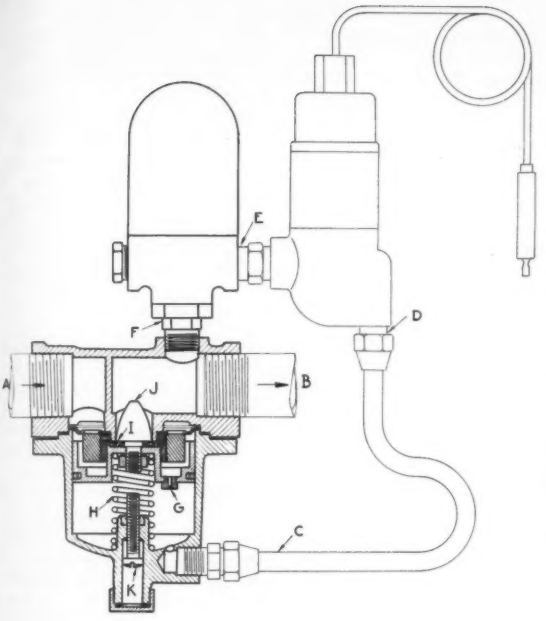


FIG. 1.—CROSS SECTIONAL VIEW OF THE CAPACITY BOOSTER VALVE WITH SOLENOID VALVE AND THERMOSTATIC VALVE CONNECTED IN THE PILOT CIRCUIT.

A—Inlet to Booster Valve
B—Outlet
C—Pilot circuit outlet
D—Thermo Valve inlet
E—Inlet of Solenoid Valve
F—Pilot return connection
G—Orifice
H—Pressure regulating spring
I—Brass seat
J—Restrictor
K—Adjustable stop screw

the inlet liquid pressure due to leakage by the piston and through the orifice "G." The spring "H" will then close the valve so that the neoprene disc will seat against the brass ring at "I" giving a tight shut off. Under these conditions the coil would be pumped down until a pressure switch stops the compressor on low pressure. Extra seating force is obtained due to the difference in pressure between the inlet liquid below the seat and the coil pressure above the seat.

When the solenoid valve is opened by having both the thermostat and push button switch closed the thermostatic expansion valve will also be open due to a combination of high bulb temperature and low coil pressure. Consequently refrigerant in the booster valve cylinder below the piston will be bypassed through the pilot circuit to the coil at a faster rate than it can leak by the piston and orifice "G" with the result that the pressure below the piston will be reduced until the difference in inlet liquid pressure and that below the piston will cause the piston to move downward. This will unseat the neoprene disc and cause the restrictor "J" to pull out of the main orifice and allow refrigerant to pass through the valve into the coil. As the coil pressure increases and the thermal bulb of the pilot thermostatic expansion valve is chilled the thermostatic pilot valve will tend to close off. When it closes so that it passes refrigerant through it at a slower rate than it can leak by the piston, the pressure below the piston will tend to rise again allowing the valve to close. Actually laboratory tests indicate that the pilot valve just modulates sufficiently so as to maintain a pressure below the piston from 2 to 6 lbs. per square inch less than the inlet liquid pressure and thus causes the piston to modulate to keep the proper coil pressure.

Thermostatic expansion valves used at capacities considerably below their capacity usually show a tendency toward surging, the degree of surging depending upon the coil design and other variable factors. The tendency to surge is minimized by having an orifice size that just takes care of the demand. In the capacity booster valve having a 5/8 inch orifice the actual capacity is well over 60 tons. However, it will not surge on a 10 ton load or even 5 tons if the "surge adjustment" or adjustable stop screw "K" is set to limit the maximum opening of the valve to the maximum capacity of the system it is used with.

It will be noted that the functions of

shut-off and modulation are separate and distinct in this valve. The neoprene disc seats on the brass seat for tight shut-off, but has nothing to do with the throttling which occurs between the main orifice and the restrictor piece. The brass restrictor piece, on the other hand, has nothing to do with sealing off the orifice, but does modulate in such a way that there is no place in the valve movement where an abrupt change in flow occurs.

The piston ring has two uses. Primarily it serves to add sufficient friction to the piston to prevent fluttering and at the same time it helps to control leakage by the piston while allowing sufficient piston clearance to prevent any possible sticking in the cylinder.

The friction effect of the piston ring in addition to the restrictor which causes a tapering rate of flow prevents any liquid hammering in any kind of service.

A screen of about 8 square inches area is located above the piston and strains all the refrigerant entering the valve. A line strainer ahead of the valve is recommended, however, and in fact, in systems having over 20 tons capacity it may be advisable not to use the screen as it might cause an excessive pressure drop by the screen itself.

Action of the Pilot Valves

The pilot valves only pass the amount of refrigerant through them which leaks by the piston. Consequently only a small opening of the pilot thermostatic expansion valve is required to take care of this leakage with the result that the suction pressure will only drop a very slight amount below that at which the valve just starts to open. Probably the change in evaporation temperature due to the pressure change required to cause full opening of the booster valve will be only two or three degrees. In contrast to this some expansion valve capacities are rated according to the flow that obtains when the suction pressure is dropped an amount which corresponds to a six degree change in evaporation pressure. The operating superheat of the booster valve combination consequently holds more nearly constant than it will for a high capacity expansion valve of the usual construction.

In some high capacity air conditioning systems the indirect method of cooling is used so that a high capacity expansion valve is required in connection with a water cooler which is to supply cold water to the air cooling coils. If the refrigerating capacity were over 100 tons so that one booster valve would not take care of it, two or more could be manifolded together using only one thermostatic expansion valve for pilot service. In this way the cost per ton for expansion valves would be still further reduced.

Using a capacity booster valve for thermostatic expansion valve action will probably prove to work out economically from the cost standpoint when the tonnage required is from 10 to 15. However, where solenoid stop valve action is also desired the economical point will probably start at about 7½ to 10 tons.

Further Advantages

Further advantages of the capacity booster valve for expansion valve use include the multiplicity of the types of action that can be obtained. For instance, some engineers prefer the type of action the liquid charged thermostatic expansion valves give and at the same time may want to limit the maximum back pressure to a safe limit which will not overload the condensing unit. In this case an automatic expansion valve may be used in series with a thermostatic expansion valve in the pilot circuit. At the same time a pilot solenoid valve may also be used if desired. In this latter case with the solenoid valve open the automatic valve can be set to open at 30 lbs. in which case if the thermostatic bulb temperature is high the automatic valve will take control until the whole coil is refrigerated when the thermostatic valve will take control and cause a further reduction in suction pressure below 30 lbs. In this type of combination the maximum back pressure can be adjusted by means of the automatic expansion valve. On the other hand, a maximum back pressure feature can also be obtained by using a pilot thermostatic expansion valve which has that feature.

In air conditioning installations it may in some cases be an advantage to limit the minimum back pressure to such a point that severe coil frosting cannot occur. In water coolers a minimum back pressure may be required to prevent water freeze ups while at the same time full coil capacity may be desirable at the higher back pressure. In this case an automatic expansion valve and a thermostatic expansion valve may be used in parallel in the pilot circuit. The thermostatic expansion valve would then take charge at high back pressures while the adjustment of the automatic valve would determine the minimum back pressure.

Other uses which suggest themselves for

a valve of this type include high capacity solenoid valve applications where a small solenoid valve is used in the pilot circuit.

The booster valve may also be used as a water valve, with a small valve for pilot service. In this connection a solenoid valve may also be used in the pilot circuit to provide positive water shut off during motor shut down periods. This type of valve will eliminate any possibility of water hammer due to its slow closing action and restrictor which tapers off the flow gradually. The closing time of this valve may be varied up to 30 seconds with water depending upon the opening in the leak by orifice "G."

The capacity booster valve may also be used with a low side float valve of small capacity to supply refrigerant to a high capacity flooded evaporator.

A number of other uses in connection with various pilot valves present themselves as the occasions for their use arise. The expansion valve use is one in which considerable economy in valve costs can be obtained.

Licensing and Bonding Regulations in Wisconsin

AN additional section of the statutes of the state of Wisconsin has been drawn up and submitted to the state for approval. The new section is intended primarily for the purpose of licensing and bonding of contractors and others engaged in the construction, installation, alteration and replacement of mechanical refrigeration systems.

The bill has not as yet been passed and, of course, is subject to some revision; however, it is interesting in its proposed form and is therefore reproduced herewith.

Section 1. A new section is added to the statutes and a new subsection is added to section 20.57 of the statutes to read: 101.41 Refrigeration Installations. (1) *Board of examiners created.* There is created within the industrial commission a "board of examiners of mechanical refrigeration licensors." The board shall consist of five members, one member from the industrial commission, two from the American Society of Refrigerating Engineers of Wisconsin, and two licensed installation contractors, one of whom shall be a member of the Wisconsin Refrigeration Contractors association. The appointments shall be made by the governor. The first three members shall serve for two years and the last two members for four years and thereafter all members shall serve for a term of four years. A majority of the board shall constitute a quorum for the exercise of authority conferred upon it. Vacancies shall be filled in the same manner as original appointments. The rules and regulations adopted in pursuance of this section shall be construed liberally to secure, safeguard and guarantee the public health, comfort and convenience.

(2) *Duties and powers of the board.* It is the duty of the board of examiners to perform and enforce the provisions of this section. The board of examiners has the power to examine the qualifications of applicants, to grant licenses, and for cause, to suspend or revoke such licenses. The board shall prepare and formulate rules and regulations in respect to the construction, installation, alteration, or replacement of refrigerating systems and prepare formulae, standards and specifications for materials, workmanship and manner of execution of work. It shall enforce such rules and regulations and have authority to prescribe forms for all applications, notices and reports.

(3) *Salaries and expenses.* The members of the board, with the exception of the industrial commission member, shall be paid the sum of ten dollars per day for time actually spent in the performance of their duties and travel and other expenses necessarily incurred.

(4) *Application for license.* All persons desiring to engage in the construction, installation, alteration, and replacement of refrigerating systems shall apply for a license to the board of examiners and shall present

therewith the fee hereinafter required; except that none of the provisions of this section shall apply to railroad companies, or their employes, engaged in constructing, installing, altering, replacing or maintaining refrigeration or air conditioning equipment carried on in their shops in this state, maintained and operated as a part of a railroad system. Every application for license must be made on printed blanks furnished by the board of examiners. Refrigeration is the utilization of a system which consists of a combination of parts in which a refrigerant is circulated for the purpose of extracting heat through absorption in its expansion or vaporization.

(5) *Qualifications of applicants.* (a) An applicant for a license shall show that he has been actively engaged in the installation, alteration, and replacement of refrigerating system for a period of at least three years provides that a credit for one year shall be extended for graduation from a recognized school of engineering. The applicant shall have a knowledge of refrigerants and the types of refrigerating systems in the business or field in which he desires to operate as licensee. Any person, firm or corporation employing a licensee may employ such other labor as may be necessary without such employes securing a license hereunder.

(b) All applicants must prove the extent of their experience, be at least twenty-one years of age and of temperate habits and good character, all of which must be vouched for in writing by at least two citizens of this state. If, upon investigation by the board of examiners, the applicant is found to meet with the requirements of this section and the rules and regulations prescribed by the board of examiners made in pursuance thereof, the applicant shall then be examined as to his fitness in one or both of the classes hereinafter provided for. The fee for a low pressure license is fifteen dollars; the fee for a high pressure license is fifteen dollars, and a separate license is required for each class. Any combination of said qualifications may be so designated or evidenced on a license certificate.

(6) *Classes of licenses.* The refrigerants shall be divided into two classes and separate licenses shall be required for each class.

(a) The first class is the low pressure type as follows:

Dichlorodifluoromethane (Freon-12) ..... (CCl_2F_2)
Dichloromonofluoromethane (Freon-21) .... ($CHCl_2F$)
Dichlorotetrafluoroethane (Freon-114) ..... ($C_2Cl_2F_4$)
Dichloromethane (Carrene No. 1 Methylene Chloride) ..... (CH_2Cl_2)
Trichloromonofluormethane (Freon-11) (Carrene No. 2) ..... (CCl_3F)
Dichloroethylene ..... ($C_2H_2Cl_2$)
Ethyl Chloride ..... (C_2H_5Cl)
Methyl Chloride ..... (CH_3Cl)
Methyl Formate ..... ($HCOOCH_3$)
Sulphur Dioxide ..... (SO_2)
Isobutane ..... ($(CH_3)_3CH$)

(b) The second class is the high pressure type as follows:

Carbon Dioxide ..... (CO_2)
Ammonia ..... (NH_3)
Butane ..... (C_4H_{10})
Ethane ..... (C_2H_6)
Propane ..... (C_3H_8)

(7) *Term of license and renewal.* If an applicant, after examination by the board, is found to have the requisite knowledge and experience, he shall be granted a license for one year from July first. Such license shall be annually renewed without examination upon the payment of the renewal fee of fifteen dollars for each class, provided it is presented for renewal within thirty days after the expiration thereof. Any person may reapply for a license in the same manner as an original application, if his expired license has not been renewed within the required time. Such licenses shall not be transferable.

(8) *Suspension and revocation of license.* The board of examiners has the power to suspend the license of any person for such cause as may be set forth in the rules adopted by the board of examiners and approved by the industrial commission. The rules of the board shall provide for a hearing of the accused, with the filing of written charges, before any suspension or revocation takes effect. When the license is revoked, no license shall be issued to him until thirty days after said revocation. When it is revoked a second time he shall not receive another license for a period of ninety days after such second revocation. If a person has his license revoked twice within a period of three years, his license shall be permanently revoked. It may be restored one year after said revocation upon full compliance with the conditions and provisions prescribed for original application for license.

(9) *Bond.* Each licensee shall file a duly executed bond in a penal sum of one thousand dollars with sureties to be approved by the board, conditioned for the faithful performance and observance of the rules and regulations thereof. Such bond shall be for the protection and benefit of any person employing any licensee in the construction, installation, alteration, or replacement of any refrigerating system.

(10) *Permit.* (a) Before the construction, installation, alteration, or replacement of any refrigerating system subject to the requirements of this section, the licensee shall make written application to secure such permit from the board. The application for such permit shall describe the proposed construction, location of piping, valves and safety devices and the name and business address of the refrigeration contractor. It shall be unlawful for any person to construct, install, alter, or replace any refrigerating system unless such permit is secured.

(b) Upon the completion of the construction, installation, alteration, or replacement of a refrigerating system, the licensee shall forthwith notify the board that such work is ready for inspection and test. Such board may within a reasonable time after being requested to do so by a contractor, cause to be inspected and tested any system of refrigeration that is ready for such inspection and test. The board or its authorized agents may make such tests as deemed necessary for the purpose of safety. If the work is found satisfactory and the test requirements are complied with, the inspector shall recommend, and the board shall issue, upon such inspector's recommendation, a certificate of inspection and approval. The fee for such permit and inspection shall be two dollars. Any alterations or replacement in an existing refrigerating system shall conform to the requirements of this section.

(c) If upon investigation it is found that any refrigerating system is unsafe or hazardous, or is in a condition dangerous to life or property, written notice shall forthwith be sent to the owner and user of the refrigerating system of such condition and such refrigerating system or portion thereof shall not thereafter be operated until the same has been put in safe condition and approved by the board. Provided, that within ten days after any such written notification to such owner or user to correct or remedy any hazardous condition, an appeal may be taken to and shall be heard by the board. The board is authorized to take testimony and to grant or reject such appeal subject to review by the circuit court of the county in which the owner is a resident.

(d) No refrigerating system shall be maintained or operated employing a refrigerant other than is specified herein without a special permit issued by the board.

(e) No permit or inspection shall be required for refrigerating systems of one horsepower or less if such system contains less than six pounds of refrigerant.

(f) The permit shall be posted adjacent to the refrigerating machine or condensing unit.

(11) *Penalties.* (1) Any person who constructs, installs, alters, or replaces any refrigerating system, or who fails to obtain a permit therefor, or violates any provision of this section or any rule or regulation of the board made pursuant to the provisions of this section shall be guilty of a misdemeanor and upon conviction thereof for each and every offense, shall be subject to a fine of not less than twenty dollars, not more than fifty dollars, or by imprisonment in the county jail for not less than sixty days not more than ninety days.

(20.57) (11) All moneys received by the industrial commission under the provisions of section 101.41 shall be paid within one week of their receipt into the general fund of the state treasury, and all such moneys are appropriated to the industrial commission to carry into effect the provisions of section 101.41.

Section 2. This act shall take effect upon passage and publication.

BRITTLE COPPER TUBING

IF you have trouble reflaring copper tubing which has become brittle through long use and cracks every time you flare it, try heating the end of the tube to a red heat and then plunge it into cold water or wrap it with a wet rag.

This will soften the tubing so it will flare without cracking. The tube should be warmed again to remove any moisture.

Ellsworth Jones
New York

I am taking this opportunity to let you know how I think the R.S.E. helps in actual servicing. I have textbooks, service manuals, sheets sent out by manufacturers, and all kinds of literature pertaining to servicing of refrigeration equipment, but regardless of cost of all these, the R.S.E. is practically all I use as reference book, and more power to it.

B. F. Hopfensperger
Wisconsin

Please accept check of $5.00 enclosed for my subscriptions for another year for THE REFRIGERATION SERVICE ENGINEER and ICE AND REFRIGERATION.

We find these two magazines very educational and helpful to service men in the field

With Operating Loads on No Tw
Air Conditioning Jobs Ever Ali
FEDDERS ADJUSTABLE FLOW CONTROL VALVE

Showing typical installation of Fedders Direct Expansion Air Conditioning Coils. ↓

NOW make it easy to get Top Efficiency from entire coil area

NO DEAD SPOTS IN COIL due to lack of refrigerant or uneven air distribution.

FLOODING ELIMINATED, adjustment easily made in the field to suit conditions.

MINIMUM PRESSURE DROP assured by correct design. Each refrigerant circuit is of equal length . . . ALL POSSIBILITY OF OIL TRAPPING IS ELIMINATED.

INLET AND OUTLET HEADERS are on same end of coil regardless of number of rows. This unique feature accomplished without using dryer tubes.

STAGGERED TUBES AND ALL COPPER SURFACE combine maximum air handling and heat transfer efficiency.

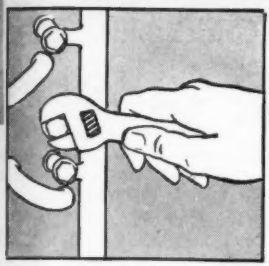
STANDARD PACKAGE UNITS simplify engineering. Coil Casing arranged for banking coils horizontally, vertically and end-to-end. Write for Bulletin on Coils, All-Season Units and High Capacity Thermostatic Expansion and Constant Pressure Valves.

← Enlarged view of Flow Control Valves incorporated in Inlet Header of Coil and controlling refrigerant flow in each circuit of coil.

Flow-Control Valves easily adjusted by means of ordinary ratchet wrench.

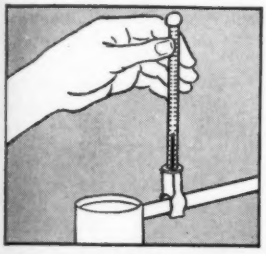
FEDDERS
MANUFACTURING CO.
BUFFALO, N.Y.

Here's how you do it!



REMOVE SEALING CAPS

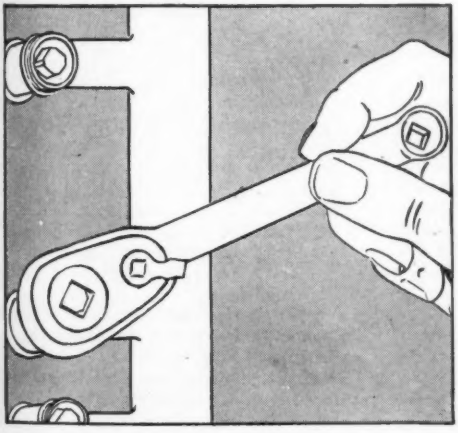
Each Flow-Control Valve is sealed with brass cap and gasket which are removed with an ordinary open-end wrench exposing the adjustable stem of the valve.



CLIP THERMOMETER TO OUTLET TUBES

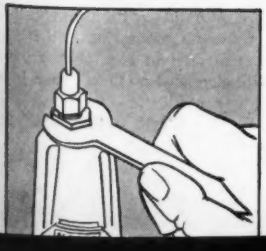
Clipping Clip-On Service Thermometer onto end of tube which enters suction header gives an accurate reading of superheat in each circuit. This eliminates all element of gamble in bringing the air conditioning system up to top efficiency.

ADJUST EACH FLOW-CONTROL VALVE TO DESIRED SUPERHEAT



Coils are shipped with valves in wide open position. Starting at bottom of coil each circuit can be adjusted to the desired uniform superheat over entire area of coil surface by turning valve stem clockwise. In most cases lower coil circuits will have to be throttled down more than the upper. While adjusting Flow-Control Valves be sure a proper amount of refrigerant is being supplied to liquid header by Fedders Model 37 Thermostatic Expansion Valve. This is checked by getting temperature of several inlet tubes or observing suction pressures.

ADJUST THERMOSTATIC EXPANSION VALVE



Showing Fedders Model 37 Air Conditioning Thermostatic Expansion Valve located on the liquid line, being easily adjusted to control refrigerant flow into inlet header in accordance with maximum demand.

After all adjustments are made and each circuit is providing desired superheat, the sealing caps should be replaced.

SERVICE KINKS

Tools and Equipment You Can Build

Under this heading will appear simplified or short cut methods of performing individual service operations; also details of how you can build special tools and equipment for your own use. Readers are invited to submit information for publication under this head.

SERVICE METHODS OF AN OLD TIMER

The following is an interesting letter received from a man who, although young in years, can be termed an old-timer in this young industry because of the comparatively many years he has spent in installation and service work. His experiences and recommendations should be of value.—EDITOR.

TO the Service Kink Editor: Sometimes a service engineer is called upon to go a considerable distance from the shop into the field to correct some job, or make a preliminary overhaul to keep a unit in operation, and it is important to have methods of definitely testing parts so that a second trip will not become necessary to check on the operation. For instance, the checking of valves after repairing, to ascertain if they will hold. Through long experience in the shop and field I have used many short cuts that are effective.

To check some types of discharge valves to see if they will hold and tell whether I have done a good job or not, I clean the seat off good and secure the valve in its correct position, and then expel the air from beneath the valve with an ordinary suction grip used to hold Ford motor valves while grinding. When the air is expelled the grip will take hold, and hold indefinitely if the valve is really seated. There are quite a number of valves on which this very convenient tool may be used.

To check the piston valve lift on a piston, secure the piston in the hand and close the piston pin holes with two fingers, then by cupping the piston over your mouth attempt to draw it in. A distinct click should be heard outwards and inwards. The total lift should equal the area and slightly more of the port opening. Checking this valve is quite simple. Secure at the neighborhood drug store one of these large nursing nipples, cut off the end, as in Fig. 1, insert and cement into this opening a small and easily collapsible rubber tube. Stretch this combination over the open skirt of the piston, and over the piston pin openings place two thin pieces of rubber about the thickness of a bicycle inner tube, hold these in position with two fingers and insert the small tube in your mouth and evacuate the air from the piston. If your valve is holding the small tube will collapse, the two thin rubber pieces over the

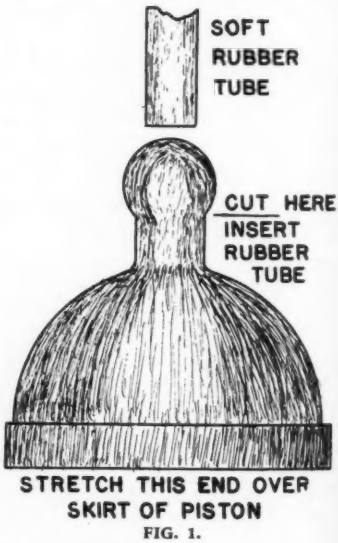


FIG. 1.

piston pin openings will try to get inside of the piston, and if your valve is holding this condition will hold indefinitely.

Some piston valves are hard to get truly surfaced and at perfect right angles to the opening. For instance, on some of the early Kelvinator and Copeland Models, there were two faces. This job becomes quite easy by using the following method. Take a fairly hard disk and secure it to the seat surface, so there is little or no lateral movement, then load it with a one pound spring and lap as perfect a surface as you can, then remove this lapping device and with a razor hone

see how clear and unbroken a polish you can get. If the polish is unbroken, then you can proceed to finish up the valve in this manner. Take the valve you are going to use and place it in position with a small amount of seal polishing compound on the seat face, then load it with a thin piece of automobile tire cut to size, place this on top of the valve and beneath the valve loading spring, or retaining fitting and secure the combination with its hold down screw. Rotate this a few times then remove it and discard the rubber loading device and replace the valve, its loading spring or retainer and you will really have a valve that holds.

Undersize Liquid Lines

Sometimes discharge valves are burned up; it occurs quite frequently on some types of machines. The machine is apparently all right for the duty it is called upon to perform, but still the head pressure is abnormal. It is a pretty good idea in these cases to check the liquid line. Generally one size larger will correct the trouble. In my experience in the U. S., South America, and some parts of Europe, I have run into this many times. Undersize liquid lines can cause a starved regulating valve and starved regulating valves can cause a lot of trouble all over the system.

One other thing that is overlooked by the average service engineer in units on which he holds a long time contract, is the matter of replenishing refrigerant. It is an advantage to have a charging valve inserted between the liquid service valve and the low side regulating valve. It will really be appreciated when you see how simple it works, and in charging this way you have no abnormal conditions arise while you are charging. Of course, we always used them on the early carbon dioxide and ammonia machines, and on the small machines they will save the numerous other operations you generally perform in this particular job of service work.

There are many machines today going into the junk heap through improper service and installation. You can't make a service man in six months or in a single season. It is a long and serious apprenticeship and a long series of diagnosing troubles which requires an expert knowledge of all manner of refrigerants, of which up to the present time some 22 different kinds have been tried and used. Each one acts different even under the same conditions; each has its preference for certain applications; but when it is all said and done regardless of the refrigerant, a domestic machine should last twenty years. I had occasion last month to look at two machines I installed 19 years ago at Hebron, Nebraska. In that time the motor bearings had been changed twice for each machine, and one machine had a belt changed one time, the original oil and sulphur dioxide I placed in them 19 years ago was still traveling around in those units, speaking quite well for this refrigerant. At that time these small machines were new to us. We set them up and installed them in good insulated ice boxes and we took the same care in installing these miniature machines, as we would a machine capable of producing 50 tons of ice per day.

There has never been a poor machine made and placed on the market, and all machines properly installed and serviced, should live for many years. In the refrigerator graveyard there are many keen designs that went there due to poor service, improper application and, worst of all, high pressure selling. Even today improper claims are made, not by the manufacturer, but by others anxious for a profit. This very fact provides the service man an income, and that income can be great if you are good.

Careful Work Important

Of the larger machines, I can remember years ago of grinding valves by the hour, the old carbon dioxide valves, the old ammonia valves, and the valves for the very noisy and dry sulphur dioxide machines, and after completion have the chief engineer check them with chloroform to see if they leaked. The same care we used then is more essential today in the small machines, where tolerances have been reduced to the minimum and condensing requirements have been scraped to the bone, and motors abbreviated to a fraction of their former size.

It is true today as it was then, there are no poor machines produced with the exceptions as noted, that when the life was short, it was always due to improper installation, improper service and abuse beyond the capacity of the machine. In closing I would like to mention a very handy tool that every small shop should have. For several years I carried about with me, mounted on a small delivery truck running board, a small toolmakers lathe, 9¼ inches by 2½ feet, having four speeds forward and backward, powered by a ¼ h.p. motor, 110 volt universal type, and equipped with screw cutting gears. It

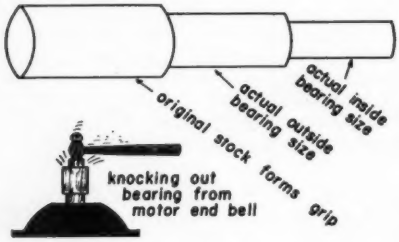
can be hooked up almost any place and special jigs and other tools can be produced quite quickly. Special cutting tools can be secured for cutting and turning and time and again I have found it a life saver in the field.

Martin G. Lane
Eureka Engineering Service
Sioux City, Iowa.

Motor Bearing Drift

By JACK JOSEPHSON
Josephson's Elec. Refrig. Serv.
Bridgeport, Conn.

SEVERAL different sizes of these motor bearing punches will be found a handy addition to the service kit or shop equipment. The tool provides an easy means of removing and replacing motor bearings.



If you have a lathe available the tool can be quickly made from round machine stock, shaped as shown and to the diameters required by the motors you come in contact with. About three sizes will cover the majority of motors used in refrigeration work.

Grunow Puller Attachment

By P. A. MASS

BY boring the holes, shown in the drawing, in a 1¾-inch by ⅛-inch piece of strap iron 2⅝ inches long, you can use a common two-jaw puller to remove the motor rotor from Grunow compressors on Models C and D units.

In using this attachment, bolt it to the rotor through the two ¼-inch holes, with the screws that are already on the rotor. Now hook two jaws under two sides, as shown in drawing, and draw up screw of puller against shaft through the 1 1/16-inch center hole.

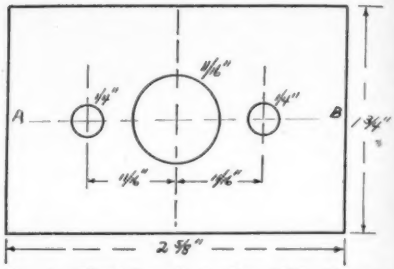


Fig. 1.—Material used—1 piece 1¾" x ⅛" strap iron. Hook two jaws of common two jaw puller under sides A and B

This small attachment is easily made up and eliminates the necessity of buying a special puller, as a two-jaw puller is found in most any shop.

Spring Winding Jig

By ED. McDONALD
Glendale, L. I., N. Y.

IT is often very difficult to find a source of supply for the proper size small springs which you occasionally need in your work and much more time than the spring is worth is expended in trying to find one.

Piano wire can be purchased at most hardware stores and if you carry a few assorted sizes in stock you can easily make your springs with the aid of the jig shown in Fig. 1.

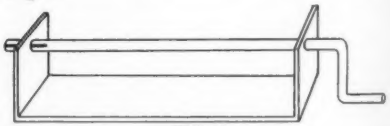


FIG. 1.

The frame of the jig is made of a piece of flat steel 15 inches long with ¼-inch holes drilled ½-inch from each end and then bent 2½ inches from each end. This forms a base 10 inches long.

Several winding bars should be made of round steel of different sizes to accommodate the different diameters of springs you will wind. Each rod should be 15 inches long and slotted in one end as shown. The other end may be bent to form a handle.

The jig may be gripped in a vise or fastened permanently on your bench. Insert the end of the piano wire in the slot of the winding rod. Keep a good tension on the wire with a pair of pliers and wind until the desired length of spring is obtained.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

ILG REFRIGERATOR

QUESTION 328: I had a call on an Ilg refrigerator. The valve seemed to be stuck shut. Hot cloths on expansion valve opened it up so about two ounces of alcohol were put in the system. This seemed to work all right. I was called back because the valve was stuck shut. Opened the valve, removed the screen, removed sediment, re-installed, and again it stuck. I opened the valve again, and this time the screen was just loaded. I removed the tank, cleaned with carbon tetrachloride, cleaned the valve and washed out compressor with three changes of oil. The job runs nicely—3 minutes on, and 12 to 15 off. Refrigerator is located in an addition to a kitchen and from all accounts is terribly hot in the summer time. Arranged to have refrigerator moved in the summer. Recently it has been as cold as 12 above zero and as the job runs very cool I just wonder if it is too cold. Have used Cappella oil. What are your suggestions for a conversion?

ANSWER: Apparently you have satisfactorily overcome your trouble with the Ilg refrigerator, which was due to dirt in the system causing the expansion valve to stick, and now your only worries are those concerning the surrounding temperature of the refrigerator and what results you will obtain in summer weather.

Since you have arranged to have the refrigerator moved in the summer time, I take it for granted this problem will be satisfactorily overcome. As for the low temperatures experienced at present, when the surrounding temperature reaches 40 degrees or less, there is apparently no reason for running the refrigerator at all, since the room temperature is cold enough for the preservation of food. When the surrounding temperature is lower than 30 degrees, or as low as 12 degrees above zero, as you have stated, then it seems the problem is more one of applying heat to the refrigerator in order to keep foods from freezing, rather than one of keeping the machine running.

The only harm that can develop in the machine due to such low temperatures is oil slugging in the compressor, due to the refrigerant condensing in the compressor during the off-period, and carrying the oil away with it when the compressor is first started. This may run the compressor out of oil, leaving the bearings dry, so that they may score the shaft and bearings.

I don't know what you are asking for when you ask for suggestions for conversion. Possibly you are interested in conversion to another refrigerant. If so, I don't think that I can recommend any refrigerant that would be satisfactory in this particular refrigerator. Sulphur dioxide has the closest characteristics to Isobutane, but you will have considerable difficulty in drying this unit sufficiently so that sulphur dioxide will operate without gumming up the compressor.

REFRIGERATING A DISPLAY WINDOW

QUESTION 329: I have been asked to advise the size condensing unit needed for a walk-in cooler and a window display case. The cooler is 8 ft. by 8 ft. by 6 ft. inside measurements and is insulated with 4 inches of rock wool, two layers of paper and one-inch thickness of wood inside and outside, for which I installed a half horsepower condensing unit. I am enclosing a rough sketch of the window display case. What I want to know is which would be the most economical to run: one large condensing unit or separate ones for the cooler and the display case.

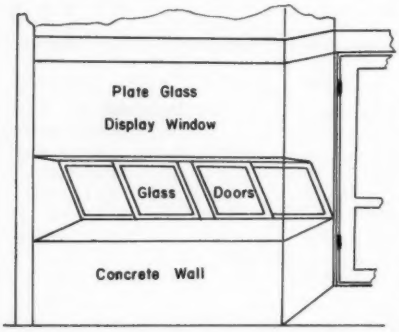
If you think the one condensing unit will be enough will you give as close as possible the size required, as well as the sizes of both if two are required.

Will you also give me the best method of installing these units?

What size coil will be required for the window? My customer would like to keep the window down to about 42 or 44 degrees and the highest temperature would be about 92 degrees, making a 50 degree temperature difference. There will be an awning over

the window and the sun shines on it from about noon. The store closes at 6 p.m.

ANSWER: To refrigerate a space such as you have described would be almost as difficult and expensive as refrigerating a coal bin, because of the fact that the heat loss through single glass is very high and the space you describe is more than two-thirds



glass. The remaining surface area apparently contains no insulation and, therefore, the heat loss in all surfaces is rather high.

According to my figures, the B.t.u. load would be in the neighborhood of 7700 B.t.u. per hour, and it would require a ¾-hp. water-cooled unit, or a 1-hp. air-cooled unit to handle it. Because I think you will find this sort of a job entirely too expensive for the rather doubtful results you will obtain, I am not going to discuss it any further.

I would suggest that in place of this type of construction, you sell your customer a small 6 ft. display case, which can be purchased for this particular purpose, and placed in the window. These window display sections may be used with a greater economy in operation, due to the fact that a ¼-hp. or ⅓-hp. unit will handle it, and the original cost will not be much more than that of the job you are figuring on.

While one unit to handle both the cooler and display case may operate a little more economically, I would be in favor of installing two separate units. It is very probable that your customer would not want to use the display case over week-ends, or during the colder winter months, and by using two separate units, it would be possible to shut one off without experiencing an over-rating on the cooler. Also, the added flexibility of two units permits the repair of one while the other is in operation, and still allows some refrigerated space for the use of the owner. The amount saved on the operation of one unit would probably not be sufficient to overcome the convenience obtained with two units.

Perhaps, you may go further with these two units to the extent of cross-connecting them so that either unit may be operated individually on either refrigerated space, thus giving him a greater assurance of continued service when repairs become necessary.

ICE CREAM CABINET LEAKS

QUESTION 330: I am desirous of obtaining some immediate information on a brine tank in a White Knight soda fountain that has a bad leak in one of the ice cream holes.

Upon writing the manufacturer they state they could not furnish us with a brine tank unless we had the exact dimensions and this would take a period of a month or better, in which time the fountain would be laid up in the customer's place of business. Also this same time would be needed to replace the expansion plates. I am wondering if there is some solution or some never-leak product which can be added to the brine to stop this leak. Should this be possible it would save a great deal of trouble and a great loss of time as far as the operator is concerned. Please note this brine is of calcium choride solution.

ANSWER: I am sorry to say that I cannot recommend any solution or material which will stop leaks in brine tanks containing calcium chloride.

I believe numerous methods and solutions have been tried to do this particular job, but none of them have met with any success. The final conclusion seems to be that when a leak occurs in the brine tank, the only remedy is to convert it to the dry expansion plate type, or to replace the entire tank.

Even with trying to remove the brine and solder the leaks from the inside (provided you can find out where it is leaking) there is no assurance that the job will not leak again at some other place, because once the metal has started to eat through, new leaks will spring up within a short time.

I don't quite understand why you consider it will take a month or more to make replacements with an expansion plate type of conversion. As I understand the routine, it is only necessary to send such companies as Dole Refrigerating Machine Co., 208 N. Clinton St., Chicago, the inside dimensions of your brine tank, and they will immediately supply you with the necessary plates from their stock. I believe it would be possible to obtain these within two days. The instal-

lation of them should not require more than about two days' work for two men. However, there may be some other complications which would require some delay in making this repair.

GASOLINE POWERED REFRIGERATOR

QUESTION 331: We have a room to cool to 15 degrees above zero—size 5 ft. wide by 9 ft. long by 6 ft. high—to hold four tons of horse meat, which is ground up and frozen in cakes and piled up. They will use about 50 to 75 lbs. a day. We want to use cork board or balsam wool 6 inches thick. The room is figured above inside measurements with this insulation. We have figured a 1½-hp. machine with 385 sq. ft. of coil. Would you use an open coil or a fin coil?

We also have to drive it with a gasoline motor. How could we regulate the stopping of the machine? How could we make it have a longer cold hold-over, or would it be needed? The room is in the basement of a house. The door would be opened two or three times a day. We intend to use F-12.

ANSWER: According to my estimation of the job you have on hand, there will be a total heat leakage in the box of about 32,000 B.t.u. per 24 hours, and assuming that you will want to freeze about 500 lbs. of horse meat per day, your product load will be in the neighborhood of 66,000 B.t.u. per 24 hours.

I am assuming, of course, that this meat is going to be both frozen and stored in the same box, and that the 1½-hp. machine will take care of both operations. This checks satisfactorily with my figures, and a 1½-hp. air-cooled machine should handle it satisfactorily.

Since the machine is going to be driven with a gasoline motor, I assume it will be very desirable to operate the machine as few times a day as possible, because it would be quite an item of expense to have to start the machine once every hour or two hours, as would be the case in the normal electric installation. It would be desirable, if possible, to have the machine run for perhaps a 12-hour period, and remain idle for 12 hours, so that the operator would be required to start it only once a day.

If this is the case, the use of fin coils or bare pipe coils would not be satisfactory,

and I would recommend that you plan on using the eutectic solution or brine-type evaporator. The Dole Refrigerating Co., make what is known as the "Dole Plate" which is particularly adaptable to this type of work. I would suggest that you use their type of plate, using a zero degree eutectic solution and operating your machine with possibly a minus five degree refrigerant temperature. These plates can be arranged in one section as shelves on which freezing of the meat can be done, and another bank of the plates overhead will take care of the heat load in the box. You would require approximately 55 sq. ft. of plate surface for the shelves, which would give you five plates, or depending on your arrangement, about five shelves. In addition to this, you would probably need about 63 sq. ft. of plates located near the top of the box, which would take care of the heat load or heat leakage.

While I do not know of any manner in which you can start this machine automatically, it would be a very simple matter to arrange it to stop automatically by using the standard type of pressure control on the machine, and connecting it in series with the ignition of the gasoline motor. When the refrigerating system has reached the cutting-out point, the switch will open, disconnecting the ignition and stopping the motor. I would suggest that you use both a low pressure and high pressure control, connecting both of them in series with the ignition, so the machine will be thoroughly protected.

COLD WEATHER TROUBLES

QUESTION 332: I have been asked to check a restaurant cooler that was originally designed to operate at about 38 degrees. The coil is of the blower unit type with a thermostatic expansion valve. The compressor is a 3/4-hp. G.E. unit. Temperature is controlled by low pressure control. The user had the control set to operate at about 34 degrees. It still operates at about 38 degrees. Sometimes after the unit shuts off it will not kick in until the temperature is up to 60 degrees. Other times it will kick on and off at short intervals. These latter conditions are not frequent, however, but the temperature never goes below 38 degrees. SO_2 is the refrigerant used. What should be the operating back pressure? What would you say is the trouble?

ANSWER: Judging from the erratic action you are experiencing with this refrigerating system, or in other words, the fact that the refrigerator will at times remain idle until the temperature has reached about 60 degrees, I am inclined to believe that the condensing unit is installed in rather a cold location. Usually action of this kind is accompanied by such conditions.

If the temperature around the unit is 55 degrees or lower, it is very probable that the condensing pressure is so low that the unit does not start when it should, and the erratic action you are experiencing would result. One method of overcoming this, of course, is to devise some means of heating the space near the unit so that the temperature is always 60 degrees or more.

Another method would be to control the unit and blower in the box by a thermostat instead of a pressure control, using the low pressure control as a safety cut-out, having it set at a pressure several points lower than the usual cut-out pressure.

RELIEF FOR HAYFEVER CASES

QUESTION 333: Is there a recognized condition under which I may safely put a patient suffering from hayfever or asthma and expect 100% results?

I was told that if I placed two patients suffering from hayfever in the same room under a fixed condition, one might get along fine while the other, suffering from the same hayfever, might not even be able to stay in the room, so you see the position I am in with a customer of mine at the present time. I installed a portable unit, and it is accomplishing everything that the manufacturers claimed it should do. My customer is uncomfortable, and if I were required to add heating and humidification to this system, I could spend days at the customer's home, experimenting with different conditions. I am wondering if you can give me any information if such conditions are experienced generally in applications of this nature.

ANSWER: According to information I have been able to gather, hay fever or asthma cases are not all affected alike. In other words, some may be affected by one type of pollen, while others are affected by another, while still another group may be affected only by dust. Therein lies the difference in the treatment, and the reason why one may be given relief in one manner, while another may receive no relief at all. Only

about 60% suffering from asthma or hay fever are completely relieved by the proper type of installation of air conditioning and air filtration. It is quite probable that no two patients will be equally relieved.

Filtration Greatest Problem

Evidently, the greatest problem in these cases is that of thorough filtration of the air in the room, and this very often is governed somewhat by the construction of the room, or the house in which the patient lives. In many installations, very little can be done with the room construction which permits the infiltration of pollen through the doors, windows and other entrances.

Since the construction of homes in the tropical area would not be as solid as those in our northern sections, I presume that this condition would be prevalent in your location. The first essential would be to get a perfectly tight room. Be sure that all the outside air is filtered and keep the machine in continuous operation. However, even after all of these precautions, if the patient is affected by dust rather than pollen, the results may still be negative.

This is a subject that I think should be worked out in conjunction with the advice of a medical man, and it is quite probable that if you will contact the patient's doctor on the matter, he may be able to work with you to the extent of giving his patient the greatest relief.

S S S

Dale R. Taggart
Louisiana

Enclosed you will find $2.00 for which please continue my subscription to THE REFRIGERATION SERVICE ENGINEER.

I enjoy reading it better than anything else that I know. This also happens to be the only source of information I have been able to find in southwest Louisiana on refrigeration servicing.

Fred Orlofsky
New Jersey

Have received your information on the Crosley and would like to express my appreciation for the wonderful service which you have given to me. I only have been reading your book for a short time and can say it has been very helpful to me. I am only sorry that I did not start to get it a long time ago.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

"LET'S Go to Chicago" will be the by-word for all refrigeration service engineers. The trek will be to Chicago January 15th to 18th to the Sixth Annual R.S.E.S. Convention and Manufacturers' Exhibit. Whether you are a member of the Society or not, all are invited to attend. The Refrigeration Service Engineers Society will be the sponsor of an important three-day educational-business conference.

Now that the active service season is showing some signs of a let-up it is time to plan your trip to Chicago to participate in what is destined to be the most important R.S.E.S. convention. The program of the Society will provide an intensive three-day conference.

You will meet with service engineers from all points of the nation anxious to contribute their share to the solution of problems as they affect your interests.

Most important is the first hand information you will secure on developments occurring in mechanical equipment.

Benefits to You

The R.S.E.S. conventions bring to you the benefit of the experience of men who are making a lifetime study of the various conditions experienced in the field. They contribute their share of knowledge to advance the best interests of the business.

National conventions are inspirational. They return you to your business enthused and encouraged to accomplish bigger things. They help you plan your business for its future growth. Your attendance at these conventions is a necessary part of your business activity.

Largest Exhibit Ever Shown

This year will be shown the largest exhibit of refrigeration equipment, supplies and accessories ever housed under one roof. The exhibit is a liberal education in itself. It provides an opportunity for you to confer with experienced engineers representing the various manufacturers who will be in attendance to answer your inquiries regarding actual operating conditions.

130 Exhibits to Date

At this date nearly 130 exhibits have already been reserved covering a most diversified group of refrigeration equipment, supplies and accessories manufacturers. The exhibit is sponsored by the Refrigeration Equipment Manufacturers Association and space as of September 1st has been reserved by the following companies:

List of Exhibitors

Acme Industries, Inc.
Aerovox Corp.
Alco Valve Co., Inc.
Aluminum Co. of America
Aluminum Industries
American Brass Co.
American Hard Rubber
American Injector Co.
Anemostat Corp. of America
Ansul Chemical Co.
Arcade Mfg. Co.
Automatic Products Co.
Bonney Forge & Tool Works
Brunner Mfg. Co.
Bush Mfg. Co.
Business News Publishing Co.
Carrier Corp.
Chase Brass & Copper Co.

Chicago-Wilcox Mfg. Co.
B. H. Clark Co., Inc.
Commercial Coil & Ref. Co.
Convention Binder Service
Copeland Refrigerating Corp.
Curtis Refrigerator
Cutler-Hammer, Inc.

Day & Night Water Heater
Dayton Rubber Mfg. Co.
Deissler Machine Co.
Detroit Lubricator Co.
Dole Refrigerating Co.
E. I. duPont de Nemours & Co.
Duro Metal Products Co.
Electrimatic Corp.
Fairbanks-Morse Co.
Fedders Mfg. Co., Inc.
Gale Products
General Controls Co.
General Electric Co.
L. H. Gilmer Co.
W. A. Hammond Drierite Co.
Henry Valve Co.
Howe Ice Machine Co.
Imperial Brass Mfg. Co.
Jarrow Products Corp.
Jewett Refrigerator Co.
Kason Hardware Corp.
Kelvinator Division
Kerotest Mfg. Co.
Kold-Hold Mfg. Co.
Mario Coil Co.
J. P. Marsh Corp.
McIntire Connector Co.
Midwest Mfg. Co.
Mills Novelty Co.
Minneapolis-Honeywell Reg. Co.
Modern Equipment Corp.
Mueller Brass Co.
Nickerson & Collins Co.
Pacific Lumber Co.
Peerless of America, Inc.
Penn Electric Switch Co.
Perfection Refn. Parts
H. A. Phillips & Co.
Portable Elevator Co.
Ranco, Inc.
Refrigerating Engineering
Refrigeration Appliances
Refrigeration Specialties
Rotary Seal Co.
Sanders Butcher Supply Co.
Servel, Inc.
South Bend Lathe Works
Spoehrer-Lange Co.
Square D Co.
Superior Valve & Fittings Co.
Tecumseh Products Co.
Temprite Products Corp.
Tyler Fixture Corp.

Universal Cooler Corp.
Utilities Engrg. Institute
Van Cleef Brothers
Victor Mfg. & Gasket Co.
Virginia Smelting Co.
Wagner Electric Corp.
Weatherhead Co.
White-Rodgers Co.
Wolverine Tube Co.
Zenith Carburetor Co.

Industry Will Be on "Dress Parade"

Chicago's famous Stevens Hotel—largest in the world—overlooking Grant Park and majestic Lake Michigan beyond—is the "parade ground" where the refrigeration and air conditioning industry will pass in review from January 15 to 18, 1940.

All meetings of the Refrigeration Service Engineers Society will be in the hotel. The exhibit will be held in the large exhibition hall.

Bring the Ladies

Each year more and more ladies are attending the convention. In addition to a special program planned for them, get-together meetings will be held to plan further activity of the national auxiliary formed at the last convention.

ARE YOUR 1939-40 DUES PAID?

AVOID any interruption in the receipt of future lecture courses or your official organ by paying your dues now. If you are a member of a local chapter, remit dues to your chapter secretary.

Your current membership certificate and receipt card should indicate that your dues are fully paid up to June 30, 1940.

The by-laws provide that a member in arrears shall not be entitled to the services of the Society until delinquent dues are paid. Keep your membership in good standing.

WISCONSIN STATE ASSOCIATION TO HOLD ANNUAL PICNIC

THE second annual picnic of the Wisconsin State Association will be held Sunday, September 17th, 1939, at Tenney Park, Madison, Wis., and a cordial invitation is issued to all members, their families and friends from Wisconsin and neighboring states to attend.

Judging by the success of last year's picnic and the added efforts being put forth

in this year's arrangements, it is expected that the attendance and success this year will surpass all other such gatherings held. Every one associated with the refrigeration industry is invited to come prepared to spend an enjoyable day.

Among the entertainments offered will be a ball game between different groups in attendance. The annual game between the Rockford and Madison Chapters to decide once again the champion of these two rivals will be the main feature of this event.

Attendance prizes will be offered to add interest to the day and a well-known speaker is scheduled on the program. A number of other games, races, etc., are planned for both children and adults.

Family groups are requested to bring their own lunch baskets, but coffee and other liquid refreshments will be served.

ILLINOIS STATE ASSOCIATION TO HOLD CONVENTION NOVEMBER 4-5

OFFICERS of the Illinois State Association have announced that their second annual meeting and convention will be held November 4th and 5th, 1939, at Rockford, Illinois.

Arrangements have been made with the Nelson Hotel in Rockford to house the convention and to make available accommodations for all visitors. Plans are being rapidly completed for an interesting educational and entertainment program for the two days and it is expected that a large attendance will avail themselves of this two-day opportunity to visit with representatives of all branches of the industry.

Members and their families from Illinois and all neighboring states are urged to make plans now to attend the meeting.

SECOND ANNUAL PICNIC OF SPRINGFIELD CHAPTER

THE second annual picnic of the Springfield Chapter was held at Lake Springfield, Sunday, June 4.

Although it was a very cool day, the boys were able to keep warm due to the many activities that they could participate in. Baseball however predominated. The United States Electric Company and the Springfield Refrigeration Supply Company, jobbers in refrigeration parts and supplies here

in Springfield, chose up sides for the afternoon game. The "Sotoo Snuffers," sponsored by the Springfield Refrigeration Supply Company, beat the "Methyl Breathers," sponsored by the United States Electric Company, by a score of 15 to 13. Mr. George E. Franck of the Imperial Brass Company was official scorer.

The high-light of the day, however, was the outdoor tube bending contest sponsored by the Imperial Brass Manufacturing Company, who was represented by Mr. George E. Franck. The officials of the contest were as follows: Judges, J. J. Kline, P. W. McVay, and William G. Benner; time keeper, John Stoppelwerth. The contestants, however, were few since the day was so cool many of the boys did not come out. However, the seven who competed were A. L. Hammond, Edw. P. Greig, F. W. Nichols, E. D. Kresse, C. F. Linderman, C. A. Hasten, and Fred Volkmar.

The contest was won by A. L. Hammond, who turned out his piece in 15 minutes and 10 seconds. Edward P. Greig was second with a time of 48 minutes and 10 seconds. All other contestants were disqualified on dimensions. First prize was a $10.00 set of Imperial tools. The winner picking the 502C Hi-Lo and the 98F Refacing tool. Second prize was $5.00 in cash given by the R. E. Thompson Co. Mr. John Stoppelwerth won the door prize of $5.00 in cash given by the Springfield Refrigeration Supply Company.

There were about 70 present, and a great day enjoyed by all.

* * *

ROCKFORD LADIES' AUXILIARY

AT the meeting held August 7, the ladies of the Rockford Auxiliary were given a demonstration by Mr. Gustafson, of the Rockford Lumber & Fuel Company, on the new "Bendix Washer." He did a complete washing and described in detail each operation, which was very interesting. There was an attendance prize given of a beautiful Waffle Set, which was won by Mrs. McCarthy.

After the demonstration Mr. Gustafson showed us several pictures which he took with his motion picture camera. These were all in colors and consisted of several trips he took into Wisconsin, also pictures of the spring flowers and fruit trees in blossom, which were all very beautiful.

Refreshments were then served and everyone had a very enjoyable evening.

Chapter Notes

TWIN CITIES CHAPTER

August 8th—The meeting was presided over by President W. Warner and the usual procedure of reading of the minutes of the previous meeting and various communications was passed over.

It was the plan of the chapter to hold a Quiz Contest at this meeting; however, due to the rather small attendance it was felt advisable to postpone the contest until a future meeting.

The meeting was adjourned after round-table discussions concerning the immediate business conditions.

CENTRAL ARIZONA CHAPTER

August 16th—The meeting opened with an explanation by Mr. Peel of the purposes and objects of the Refrigeration Service Engineers Society. This was done for the benefit of a few visitors present, and applications were passed to those who were considering membership.

A discussion arose concerning the desirability of a social supper to be held in the near future. After some consideration it was decided that the affair should be held in a location where swimming was permitted and that ice cream and refreshments should be provided. Tempe Beach, on August 29th, was considered the best place and time.

It was announced that the chairman of the Board of Directors, Mr. J. B. Contreras, had a bad accident a short time ago and was temporarily confined to bed. The chapter voted to send Mr. Contreras flowers with the best wishes of the entire membership for a speedy recovery.

DAYTON CHAPTER

August 29th—The business of the meeting was conducted in the usual manner which included the reading of the minutes of the previous meeting and reports from various committees.

After some discussion it was decided to set aside the date of October 13th for the visit of Mr. George H. Clark of the Square D Company.

It was decided that only one meeting would be held in the month of September and that

this meeting should be September 15th.

The meeting was then turned over to Mr. H. Shoupp, chairman of the Educational Committee, who provided considerable entertainment for the gathering.

Refreshments were served following the completion of the educational work.

BOSTON CHAPTER

June 12th—Among other business conducted during the evening it was decided that prospective members would be urged to buy membership pins at the time of accepting their applications.

On conclusion of the business session of the meeting, the Chairman of the Educational Committee introduced Mr. Turner of the Minneapolis-Honeywell Regulator Company, who displayed some very interesting films on the Polartron control system.

Following the showing of the films a Quiz Contest was conducted by Mr. Harris along the lines suggested by the National Educational Board. Twelve contestants took part and prizes were offered for the first three winners. The winners were as follows: First prize—Hugh Redick; second prize—J. L. Hall; third prize—J. M. Stevenson.

Refreshments were served following the contest.

LONG BEACH CHAPTER

August 3rd—With a full complement of officers present, the meeting was called to order by President H. F. Voepel and minutes of the previous meeting read and miscellaneous other business dispensed with.

The Ordinance Committee gave rather a lengthy report and answered many questions regarding the new ordinance. These questions were answered by Mr. Hogan and Mr. Willis.

The meeting adjourned rather early for the purpose of partaking of ice cream furnished through the courtesy of Curries Ice Cream Co. and cake by Messrs. Brown, Hammer and Voorhis.

MISSISSIPPI VALLEY CHAPTER

July 14th—In the absence of the President, the meeting was called to order by Mr. F. Tindall, treasurer. The regular routine of business was conducted in the usual manner and a discussion was started on the time and place for the annual picnic. Credit Island was chosen as the location for the

picnic and the time the second Sunday of September. Each family was requested to bring a basket lunch.

The Chairman of the Entertainment Committee was advised that the chapter would arrange to get cards, indoor baseball and bat, etc., and that the treasury would stand the cost of ice cream and refreshments to be served.

Upon motion of Mr. Tindall and after some discussion it was decided that the treasury should furnish the Secretary a typewriter. Mr. Wolcott was then appointed to look into the matter of purchasing one.

ONTARIO MAPLE LEAF CHAPTER

A RECENT letter from the local secretary of Ontario Maple Leaf Chapter—Mr. F. C. Strong—provides us with a running account of the year's activities of the chapter. Mr. Strong reports as follows:

"The annual election of officers was held at the March 24th meeting and balloting resulted with new officers elected as follows: *President,* K. Wood; *1st Vice-president,* J. Spence; *2nd Vice-president,* H. L. Donnell; *Secretary,* F. C. Strong; *Treasurer,* E. G. Spall; *Sergeant-at-arms,* R. O'Connell; *Directors:* G. A. Burns, A. E. Doan, J. R. Potts, R. J. Mackie, H. Draper; *Educational Committee Chairman,* Wm. Marshall.

"At the meeting held on Friday, April 28th, Dr. Truscott of the Ontario Agricultural College was the guest speaker. He gave a very instructive and interesting talk on frozen storage and locker storage, and also the use of carbon dioxide for the preservation of fruits and vegetables in special rooms.

"At the meeting of May 12th the chapter enjoyed a talk on Detroit expansion valves given by Mr. Townsend of the Detroit Lubricator Co. He was aided by a special movie-tone film he had brought with him.

"Mr. C. Davis of the Alco Valve Co. gave a very interesting talk at the meeting of May 26th, and had with him a special glass evaporator to better show the action of an expansion valve. At this same meeting a practical talk by Mr. Henry Kerr of the Canadian General Electric Co. was enjoyed by the membership. Mr. Kerr spoke on phases of air conditioning.

"Since that time we have enjoyed a Stag

Night, and on Sunday, June 25th, we held our annual picnic at Huttonville Park, where some 300 members and their families and friends enjoyed a delightful day together. Ice cream, soft drinks and milk were supplied by the chapter, and many enjoyable games were played.

"On August 11th a moonlight sail in one of the Canada Steamship Line boats was enjoyed by all members and their friends. The trip was across Lake Ontario from Toronto to Niagara Falls and return."

DOINGS OF THE PITTSBURGH CHAPTER

ON Sunday, July 30th, thirty-five members and friends met at Mineral Beach for a basket picnic. The main attraction was the swimming pool where the majority of the members spent the afternoon. The evening meal was an enjoyable affair with the group playing cards, games, and listening to the music. The White Rogers control donated by Williams and Co. was won by John Barbagallo and the merchandise slip was won by A. E. Mangus.

The annual Steak Fry was held on Sunday, August 13th, at Ohio Pyle, Pa., under the guidance of E. Vernon Black. Forty-five members and friends were in attendance. The group spent the day in swimming, ball games and hiking. The steaks were prepared by E. Vernon Black and Guy Croston. The crowd dispersed at a late hour.

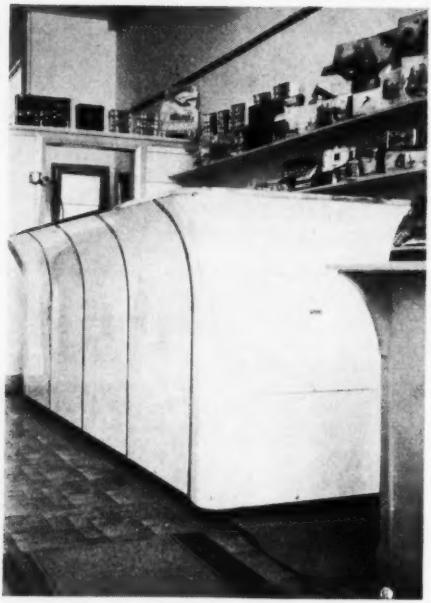
S S S

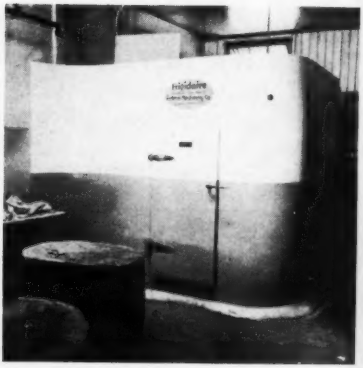
FRONT COVER SHOWS VIEWS OF COMPLETE REFRIGERATION

THE picture on the front cover of this issue shows two sides of the extremely well kept, thoroughly equipped shop of the Complete Refrigeration Sales and Service Co., located at 3819 N. Ashland Avenue, Chicago, Ill.

Fig. 1 shows the front of the building which was recently purchased by the company. The building is of brick with about 4,000 square feet of floor area. It has been completely remodeled and decorated since the company moved in and now includes a main office and a private office—both air conditioned—a sales room, a large stock room, a storage room for units under repair, a large repair shop, a spray room and gas

(Continued on page 55)





REFRIGERATION IN NEW ZEALAND

Here are two views of streamlined refrigerator fixtures designed and installed by Frederick E. Burson, sales and designing engineer of Palmerston North, New Zealand.

The left-hand fixture is a streamlined combination cabinet used for ice cream freezing and storage, soda fountain, bottle storage, milk, etc.

The above is a streamlined walk-in cooler of the knock-down portable type, 8½ ft. x 6½ ft. x 7 ft. high. It has a white glazed interior and a blue and white tile exterior.

Mr. Burson states that the idea involved in these fixtures is meeting with remarkable success in New Zealand.

storage room, and a general utility room.

Air conditioning is handled by a three-horsepower unit installed in the boiler room, operating on separately controlled units in each office.

Front view of the building occupied by the Complete Refrigeration Sales and Service Company.

The major part of the company's business consists of rebuilding hermetics, general commercial service, sales of Westinghouse refrigerators, G. E. room coolers, and commercial systems of all types.

Mr. O. S. Heide, owner of the business, has operated it for the past ten years and the rapid growth it has made is ample proof of his success.

Mr. Heide was an aviator during the World War and did a limited amount of flying during succeeding years. His spare time hobbies now, however, are limited to fishing, hunting, photography, etc. A sixty-five pound sailfish mounted on the wall of his private office bears witness to his prowess in the sport of fishing, while mounted antlers, reels of moving pictures, etc., are among the souvenirs of his other relaxations.

S S S

CALIFORNIA REFRIGERATOR CO. OPENS ANOTHER STORE AT OAKLAND, CALIF.

"SANDY" PRATT'S company with a large refrigeration and air conditioning equipment, parts, tools and supplies store at San Francisco, has just crossed the San Francisco Bay and opened a similar store at 441 23rd St., Oakland. The grand

The congenial group of people who form the organization of "Sandy" Pratt's California Refrigerator Company in California. The gentleman wearing the tall plug hat and dark-rimmed glasses is "Sandy" Pratt and the lady next to him is Mrs. Pratt. The picture was taken during the opening celebration of the company's new store in Oakland.

opening was held Aug. 26 with a big show consisting of dancing, singing, contests, vaudeville acts, refreshments, etc. Over five hundred people attended and almost one hundred "Refrigeration Service Engineers" were sold and passed out as sample copies.

COMBINATION LEAK DETECTOR AND SOLDERING IRON

THIS combination tool is designed for use as a leak detector for refrigeration systems using Freon-12, Carrene or other hy-

dro-carbon gases. It is also used as a soldering iron or blow torch.

Fig. 1 shows the tool assembled as a leak detector. In operation, the detector is burned with a small flame and the sampling hose is held close to the joints in the system. Gas escaping from a defective joint causes the flame to turn from blue to green in color.

Fig. 2 shows the tool assembled as a soldering iron. By removing the hose attachment (Fig. 1), and screwing the soldering point on the end of the burner tube, the tool is changed into a self-heating soldering iron. Without the attachment or soldering point, the tool is used as a blow torch. The flame reducer, shown, adapts the torch to jobs requiring a "pencil" size flame.

The tool burns white gasoline, benzine or naphtha (but not alcohol). It is self-generating—no pumps or pressure systems are employed. The size of the flame is regulated by the valve on the side. Using gasoline as the fuel assures a flame temperature of 1800 to 1900 degrees F., adequate for all types of soldering.

The essential parts of the tool are: the torch body, the burner tube, and the removable attachment (including the detector hose). The torch body is a brass fuel tank which is filled at the base. It is entirely covered by a bakelite handle. The

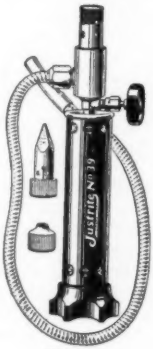


FIG. 1.

FIG. 2.

burner tube fits on the torch and holds the attachments in place.

Three attachments are included to make the complete outfit (Fig. 1). When the detector hose attachment is used, the top of the

tool is left uncovered. With the attachment removed, the soldering point or flame reducer may be screwed on the top and used with the tool. The flame reducer cuts the torch flame to "pencil" size, aiding such work as "sweat" soldering of small joints.

It is manufactured by the Justrite Manufacturing Company, Chicago, Illinois.

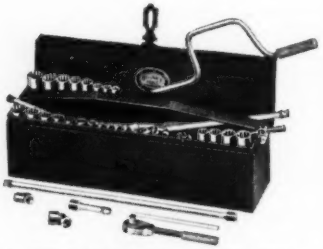
* * *

NEW SQUARE DRIVE SOCKET SET

A NEW, light weight, all-purpose socket set containing 38 pieces has just been announced by Bonney Forge & Tool Works, Allentown, Pa.

Known as No. TD4, in the popular 3/8 inch square drive to promote speedy service work, a feature of the set is its ability to handle all hexagon bolts and nuts from 5/16 inch to 7/8 inch—a range which will care for all average service requirements.

Contents of the set include eleven double hexagon sockets from 5/16 inch to 7/8 inch; four double square sockets, each 1½ inch long, from 7/16 inch to 5/8 inch; four double hexagon flexible sockets from 7/16 inch to 5/8 inch; eight extra-deep double hexagon sockets from 7/16 inch to 7/8 inch; universal joint; four extensions 3 inch, 6 inch, 12 inch and 17 inch long; 17½ inch speeder; drag link socket; 8½ inch hinge handle; 6



NEW 38-PIECE SOCKET SET

inch cross handle; 7½ inch reversible ratchet and 8 inch sliding "T."

All pieces are made of Bonney "CV" Chrome-Vanadium Steel, heavily chrome plated and polished, and packed in an attractively finished metal box measuring 19

inches x 5 inches x 4¼ inches. The box is equipped with removable tray, carrying handle and padlock hasp. The complete set weighs only 16 pounds.

* * *

PEERLESS EMPLOYEE INSURANCE

PEERLESS OF AMERICA, Inc., refrigerating machinery manufacturer, of Chicago, Ill., has adopted a group program which provides more than 90 per cent of all employees with a total of $300,000 life insurance, supplemented by sickness and accident benefits. Announcements of the plan was made by R. W. Kritzer, president of the corporation.

The group plan is being underwritten by the Metropolitan Life Insurance Company on a cooperative basis whereby the employer and employees share the cost.

General employees receive either $1,000 or $2,000 of life insurance and will be paid amounts ranging from $10 a week to $20 a week in case of sickness or non-occupational injury. The plan also includes visiting nurse care and the distribution of pamphlets on health conservation and disease prevention.

DRIERITE'S FIFTH ANNIVERSARY

DRIERITE manufactured by the W. A. Hammond Drierite Co., Yellow Springs, Ohio, is now celebrating its fifth anniversary as a commercial product of chemical research and development.

Drierite is at present important in the refrigeration industry, in the drying of cable splices in the telephone and telegraph industries, and in a new large-scale process for the dehydration of serums from the frozen state. It serves to maintain dry conditions in the holds of merchant ships, in large storage rooms and compartments, and in breathers to protect transformer oils and edible oils. It protects large machine bearings, electrical equipment, and many materials from high humidity, mildew, or corrosion. It prevents condensation in double-glazed windows and prevents the formation of gas hydrates in natural gas lines.

Production was begun in an old 20x60 foot store building in Yellow Springs. With necessary repairs this structure served to house the operations until in 1937 larger quarters were needed. An adjacent lot was available and a new structure, incorporating the com-

pletely rehabilitated old building, was erected. The new structure has a frontage of 45 feet, a depth of 75 feet, with a total area of approximately 10,000 square feet in two stories and basement.

AUTOMATIC NEWSCAST

THE Automatic Heating & Cooling Supply Co., 647 W. Lake St., Chicago, announces the issuance of their new monthly bulletin called "Automatic Newscast."

It has created quite a stir throughout the entire refrigeration and air conditioning industry because of the value of its many articles and helpful hints to the service man. In addition it is the custom of "Automatic" to offer outstanding values of quality products. The low prices offered are generally for a limited period.

The comment caused by this house organ has been amazing as well as gratifying. Those qualified to know state that it is a valuable piece of literature for anyone engaged in the industry.

Its distribution is, of course, confined to the refrigeration and air conditioning industry only and we are informed, will be mailed to those not already receiving it upon receipt of formal application on a business letterhead or with business card enclosed. There is no charge for "Automatic Newscast."

REFRIGERATION PARTS AND SUPPLY CO. CHANGES NAME

THE Refrigeration Parts and Supply Co., of Denver, Colorado, recently announced a change in name to the McCombs Refrigeration Supply Co.

In announcing the change Mr. H. R. Mc-

Combs, president of the concern, stated: "For some time past there has been considerable confusion between the name 'Refrigeration Parts & Supply Co.' and other concerns engaged in the refrigeration business, especially service. Inasmuch as we do not conduct a service department nor in any way compete with our customers, we felt that it was necessary for us in some way to identify ourselves as an exclusive wholesale supply house.

"Our policies will remain the same as always, offering you standard brands of equipment at lowest possible prices and in accordance with our definite policy of trade protection.

"Our entire business is devoted to the wholesale distribution of Refrigeration Parts and Supplies, giving us an opportunity to be of more service to you."

PEERLESS ENTERTAINS AT SEATTLE, WASH.

C. A. HULSMAN of Peerless of America, Inc., gave a moving picture demonstration to the service engineers and their friends, of the mechanical processes used in the manufacture of Peerless products. The meeting was held in the offices of Refrigerating and Power Specialties Co., Seattle, Wash., Friday evening, August 11th.

R. J. DAVIS NOW WITH SWEDEN FREEZER

R. J. DAVIS, until recently the chief instructor at the Thermo Institute of Refrigeration and Air Conditioning at Los Angeles, Calif., has become associated with the Sweden Freezer Mfg. Co. of Seattle, Wash., as designing and production engineer.

Index to Advertisements

Airco Refrigeration Parts 56
Airo Supply Co. 51
Alco Valve Co. 6
Alter Co., The Harry 46
Aluminum Ore Co. 4
American Injector Co. 48
Ansul Chemical Co. 42
Automatic Heating & Cooling Supply Co. 58
Automatic Products Co. 2

Berdor Electric Co. 57
Blythe Co., H. W. 60
Bonney Forge & Tool Works ..... Back Cover
Brown Corp., The 59

Capitol City Mfg. Co. 63
Channon Co., H. 55
Chicago Eye Shield Co. 56
Chicago-Wilcox Mfg. Co. 59
Commercial Coil & Refrigeration Co. 54

Dennis & Co., W. J. 58
Detroit Lubricator Co. 10

Fedders Manufacturing Co. ..... 32 and 33
Flushing Refrigeration Co. 52

G & G Genuine Majestic Parts Service 56
General Controls 53
Goldberg Co., Herman 55

Hammond Drierite Co., W. A. 63
Henry Valve Co. ..... Inside Back Cover
Highside Chemicals Co. 41

Imperial Brass Manufacturing Co. 62

Jarrow Products Corp. 60
Justrite Manufacturing Co. 52

Maguire Co., Wm. F. 58
Manufacturers Fin Coil Co. 61
Marlo Coil Co. 45
Minneapolis-Honeywell Regulator Co. 3
Modern Equipment Corp. 5
Modern Gas Co. 63
Mueller Brass Co. 7

New Duty 61

Peerless of America, Inc. 39
Practical Instrument Co. 51

Ranco, Inc. 8
R. & H. Chemicals Dept. 43
Rempe Co. 57
Rex Refrigeration Service, Inc. 61
Rotary Seal Co. ..... Inside Front Cover

Shank Co., Cyrus 54
Snap-on Tools Corp. 44
Square D Co. 47

Tecumseh Products Co. 40

United Repair Co., Inc. 54
Utilities Engineering Institute 53

Virginia Smelting Co. 49

Weatherhead Co., The 1

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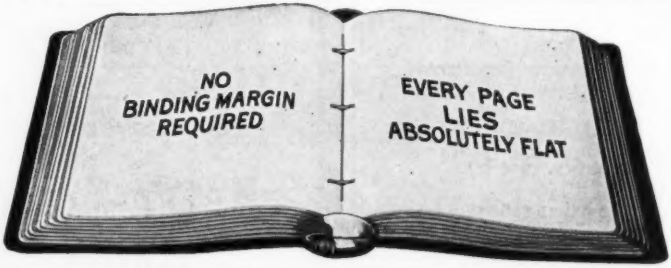

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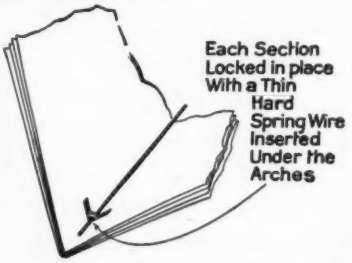

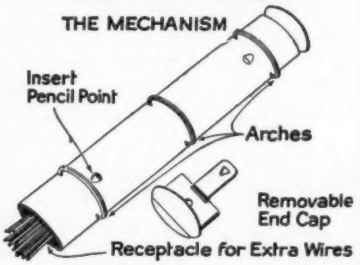

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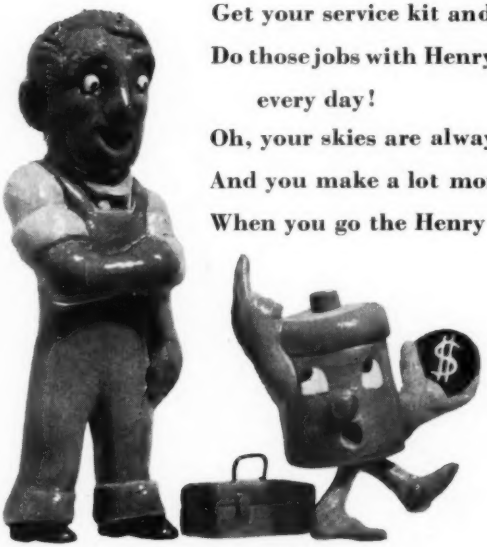
THE SERVICE SONG

By HENRY

(To the tune,
"Put On Your Old Grey Bonnet")

Like to hear those dollars rustle?
Get your service kit and hustle,
Do those jobs with Henry products
every day!
Oh, your skies are always sunny,
And you make a lot more money,
When you go the Henry way.



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